Successful universities towards the improvement of regional competitiveness: „Fourth Generation" universities

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Nowadays several successful examples prove that universities have a quite intense role in the improvement of competitiveness of certain territories and in many cases they have an active role in endeavors regarding economic development. Modern economic development demands that due to the increased social and economic commitments the traditional (education and research) activities of the universities should broaden. To be able to exploit their optimal potential regarding economic development, high quality education is a necessary but not sufficient factor. High-standard research and the adaptation of research outputs by the local economy are also necessary. Through this the competitiveness of enterprises will increase that may result in the increase of competitiveness in the region. However, these processes and effects improve the competitiveness of a certain territory through direct or indirect, mainly complex transposals. These processes and effects may vary in case of regions with different competitiveness.

The goal of this study is to review and systematize the active and passive activities of universities that serve the improvement of regional competitiveness. We explore the success factors, „bricks" with which we can characterize the internationally successful universities that have significant impact on local economic development.

Key words: R58 Regional development, planning and policy, R58 regional competitiveness

Introduction

Nowadays the competitiveness of regions is affected and altered by globalization and other background processes that serve as arrangers of regional structure and for this reason they deserve attention. In the global competition, **immaterial assets** like knowledge or social capital become key aspects, and engines of economic development. In regional studies, knowledge is identified as a **crucial factor of regional development**. **Knowledge became the main asset of production**, it is considered as a new engine of economic development, hereby the role of knowledge, innovation, technology and learning is necessary to be reconsidered. This can also be derived by the fact that the **presence of innovation** fundamentally determines the competitiveness of regions and continuous innovation is required to obtain competitive edge (Lengyel 2000). Innovation is present in quite different ways in diversely developed regions, so it is important to adapt different strategies of economic development (Lengyel 2003). Following this thought, we can point out that the competitive edge of developed economies mainly relies on their ability to create and utilize knowledge (Grosz – Rechnitzer 2005).

Universities have also a significant role in the shaping of these processes, as their educational and research priorities are widened by the conscious fostering of social and economic development (Wissema 2009, Wright et al 2008, Etzkowitz 2002).

In this study, after considering these challenges, we would like to answer **what the universities can do (by representing active or passive behavior) for the purpose of enhancing regional competitiveness**. To answer this question, first we examine the

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connection between universities and competitiveness, where the highlight of main definitions will take place. After this we will analyze the pyramid model of regional competitiveness and region-specific demonstrational models from the aspect of universities. Then we will discuss the potential effects of universities on economic development from the input-output angle. The analysis of the universities' social and economic environment will take place in the context of fourth generation universities with the help of theoretical elements like the diamond model of universities, the Triple Helix model. Finally we will attempt to specify the „components", success factors that can contribute to the activity of maximizing local potential and the enhancement of regional competitiveness.

1   Competitiveness and universities

Nowadays it is more and more accepted that not only enterprises but **different regions also compete** with each other. Competitiveness, defined as the level of holding on to competition, has become a **main definition** of economy and business sciences due to the processes and unique characteristics of globalization.

Of all definitions of competitiveness available, in this study we will use the **mainstream unified definition of competitiveness**: *„The ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels"* (EC 1999, p. 75., Lengyel 2000, p. 974.).

Between the lines, we can notice that the unified definition of competitiveness includes the effects of innovation and research and development (considered to be mainly originated from universities) regarding competitive edge. According to Lengyel (2003), if the wages do not decrease in an economy and they are not low and the products can be considered competitive, meaning that they are not more expensive and are also marketable, then this can be only achievable due to continuous innovation and technological change. By innovation, productivity is enhanced. The essential requirements of this are research and development activities and the transfer of knowledge.

From the aspect of our research the 2001 survey of Porter and Stern is significant. The two authors managed to quantify the connection between innovation and competitiveness with multivariate data analysis techniques; moreover they are also concerned with universities. From a methodological view this was carried out by the generation of the Innovation Capacity Index based on four sub-indices. This index – obviously influenced by Porter – is compared to the competitiveness index of WEF. From this they quantify regression and correlation correspondences.

The research highlights that the innovational capacity of a nation or a region not only reflects the achieved level of innovation but it is considered to be an aggregate of basic conditions, investments, policy decisions that create the milieu of innovation in a certain region. The innovational capacity determines the innovational vitality of a region and it also reflects the ability of a nation to create innovations with market value. This capacity is dependent of three factors (Porter-Stern 2001):
1. Joint innovational infrastructures are considered to be elements that affect innovation in the whole country. For example engineers, the rate of scientists in innovational processes, rate of investments into institutions performing basic research activities, country-wide policy decisions, the protection of intellectual property, etc.
2. The specific environment of the innovational cluster facilitates the development of novelty and the commerce of these products. The determinants of this are systematically built-up in the Porter's Diamond Model.

3. The connections between the previously mentioned two factors are relevant, because otherwise foreign companies will benefit earlier from the locally developed scientific and technological results than local companies. Here the role of universities, agencies, commercial associations, technological networks is emphasized, which foster the connection between enterprises and research activities.

Hereinafter the review of demonstrational models will occur that will give us an insight in **development aspects** by expanding the definition of competitiveness, and lively describing the wide-scale factors affecting regional competitiveness.

### 1.1   The role of universities in the pyramid model of competitiveness

The pyramid model of competitiveness is based on the unified definition of competitiveness, which is a handy definition, as is emphasizes two measurable economic categories: the level of income and employment (Lengyel 2000). It is applicable to enterprises and regions of different levels, so it is a complex definition. On the peak of the model we can find the ultimate goal, the enhancement of the standard of living and the quality of life.

The factors affecting competitiveness can be divided into two groups depending on their connections to economic development. One of them are mainly economic factors, so called development factors, that have an effect on regional economic development in the short-term and their enhancement can directly improve the competitiveness of operating enterprises in the region. The other group consists of factors that are mainly beyond the economy, they explain the region's competitiveness in the long-term but economic development programs can barely affect them (Lengyel 2003). Among the basic categories and development factors the model represents the influential factors that can be connected to innovation (Figure 1).

According to the logic of the model, the improvement of development factors has a direct effect on basic categories and the competitiveness of the region as a result. The **„Research and technological development"** is one of the most important development factors of the model, matching with the logical structure of regional economic development. Universities have an emphasized role in the enhancement of this development factor. The role of universities appears in three places implicitly in the pyramid model:

1. To enhance competitiveness, the **simultaneous** development of research, innovation, education and vocational training is necessary as well as the spread and presence of scientific and technological knowledge in the competitive edge of the region's active enterprises. Besides national research facilities, entrepreneurial research facilities also have a crucial effect on the competitive edge of a region. In general we can point out that relatively underdeveloped regions do not perform significant R&D activities. If there are no national research facilities in a region that is necessary to fall in line with certain technological levels, then technology transfer comes into prominence. The results of innovation can therefore come from outside the region (e. g. technology transfer), however the competitive edge of an area is mainly enhanced by effective R&D activities, universities, the presence of research facilities, the creation and rapid spread of innovation that comes from within the region. Namely this can have a significant effect of the competitiveness of the region's enterprises.

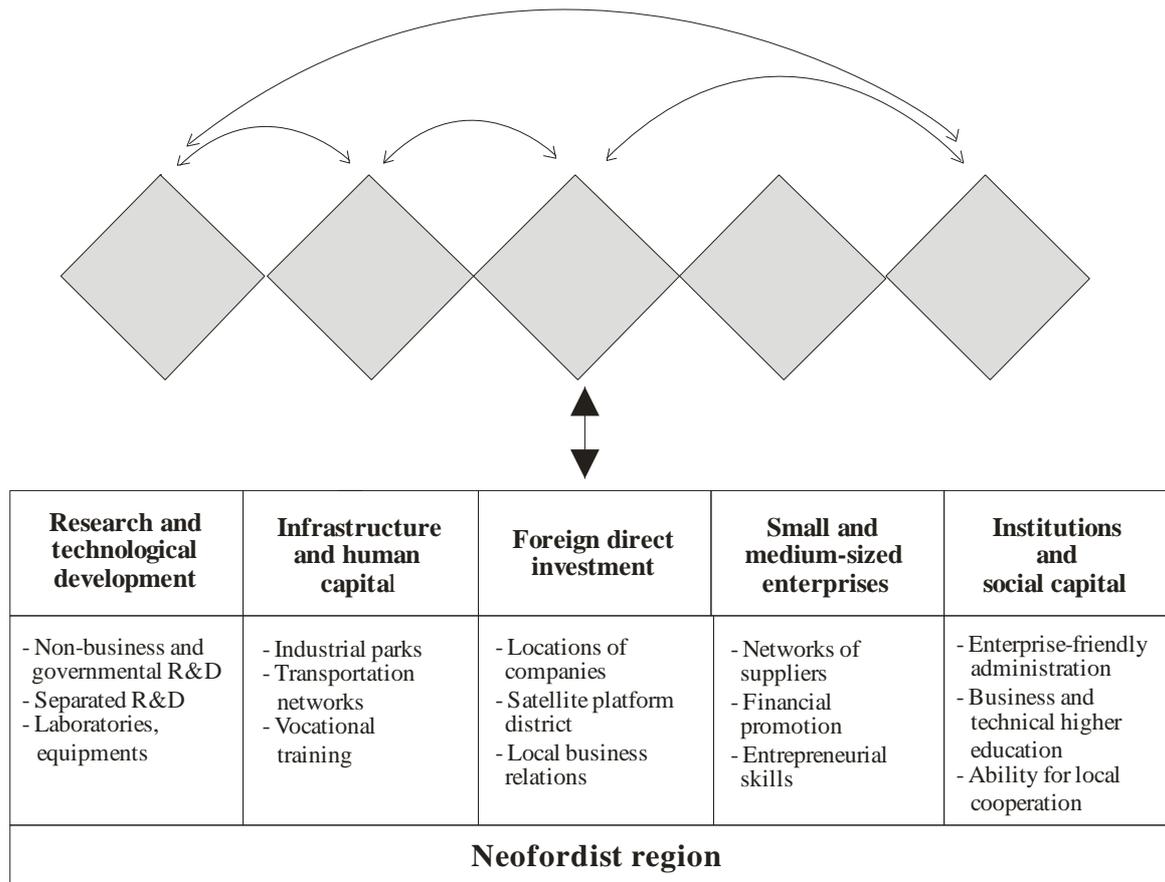Figure 1. The pyramid model of regional competitiveness
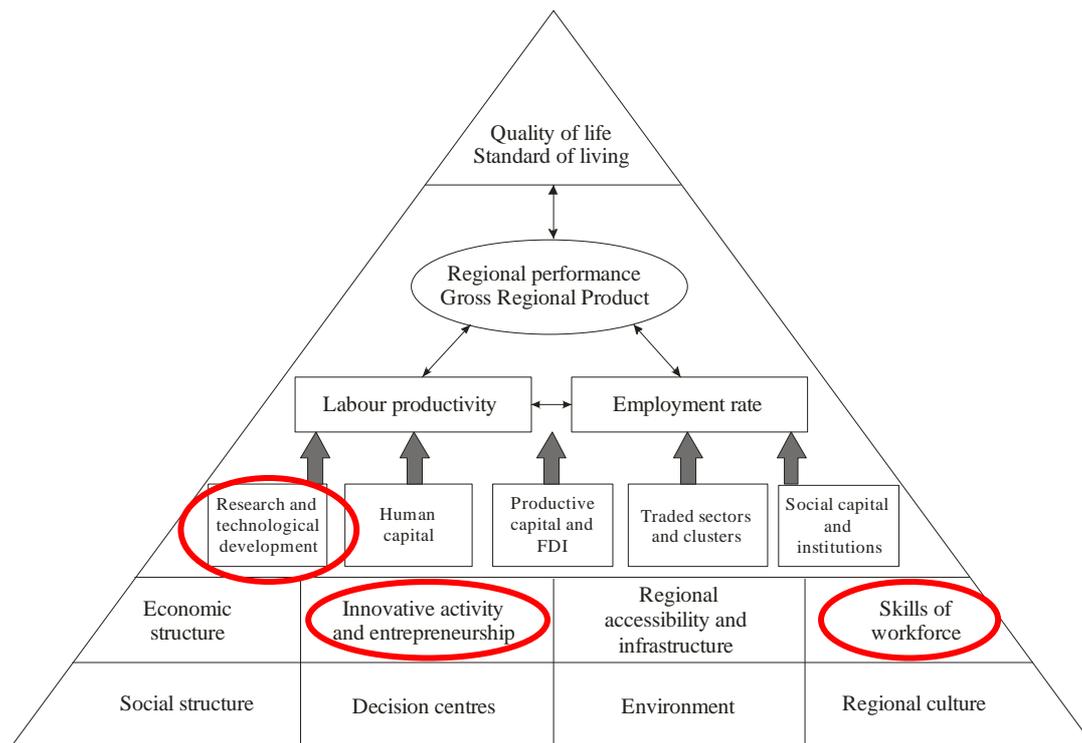
2. The bottom of the pyramid is made up by determinants that affect regional competitiveness indirectly through certain transmissions in the long-term. These are social and economic factors necessary regarding long-term success. The determinants below each other have stronger correspondence with each other. One of the success determinants is **„Innovative activity and entrepreneurship"**. In successful regions, several patents come into existence, wide-ranging innovative activities occur; the diffusion of innovation is effective. Only a few regions are capable of maintaining state of the art R&D activities, however most regions can be successful in traditional producing industry with the utilization and fast adaptation of new technologies. The innovative culture and ability is necessary to be able to respond to any technical, business, environmental etc. changes with appropriate adaptation strategies and to make benefit from innovative challenges. The ability of innovation means not only R&D or university performance but mainly entrepreneurial performance, meaning well prepared, innovative SMEs in new market sectors and advancing branches of business.

3. The universities are able to affect regional competitiveness through the „Skills of work force" success determinant. Education, as the traditional activity of a university can greatly advance or obstruct the competitiveness of a region.

In case we specify the introduced pyramid model to regions with different state of development, we will be able to get closer to answering the main question of our study, namely how can universities contribute to the enhancement of competitiveness in different regions. By augmenting the pyramid model with the development concepts of innovation infrastructure, the so called UFO-model (Unconventional Framework of Operational programming) is created, which gives opportunity to reconsider the role of development factors per types of regions. (Lengyel 2010):

1. **In neofordist regions** (regions with relatively low competitive potential) mainly basic researches take place, but these are not entrepreneurial researches. The reason behind this is that the motivation of present enterprises is cost benefits (e. g. cheap work force, tax relief). The enterprises of the region utilize innovational results of other regions generally with significant delay. In this region type mainly second generation university functions are the most active, however the aggregated knowledge and relations of professors, researchers can be the base of future development needs of continuously evolving companies. (Figure 2).
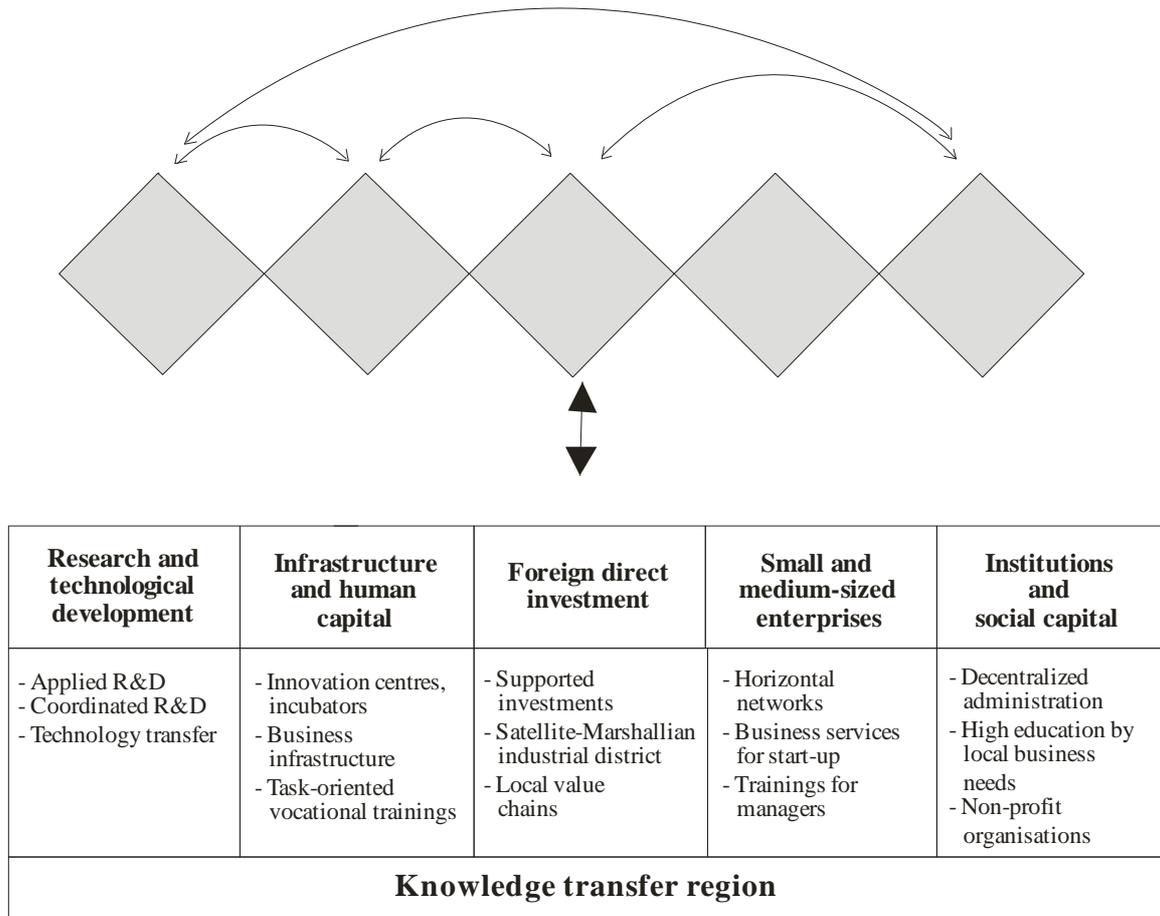
Figure 2. Bottom-up economic development of neofordist region

Research and technological development	Infrastructure and human capital	Foreign direct investment	Small and medium-sized enterprises	Institutions and social capital
- Non-business and governmental R&D - Separated R&D - Laboratories, equipments	- Industrial parks - Transportation networks - Vocational training	- Locations of companies - Satellite platform district - Local business relations	- Networks of suppliers - Financial promotion - Entrepreneurial skills	- Enterprise-friendly administration - Business and technical higher education - Ability for local cooperation
Neofordist region				

Source: Lengyel 2010

2. **In knowledge transfer regions** (region with moderate competitive potential) the role of innovation is higher; the global competition concerns more of the enterprises of the region. Innovation centers are actively functioning; however the best technologies that are accessible are purchased. The expected quality of training programmes is higher than in neofordist regions. In this type the utilizers of industrial research appear so technology transfer is set in motion. Consequently, third generation university functions start to operate (Figure 3).
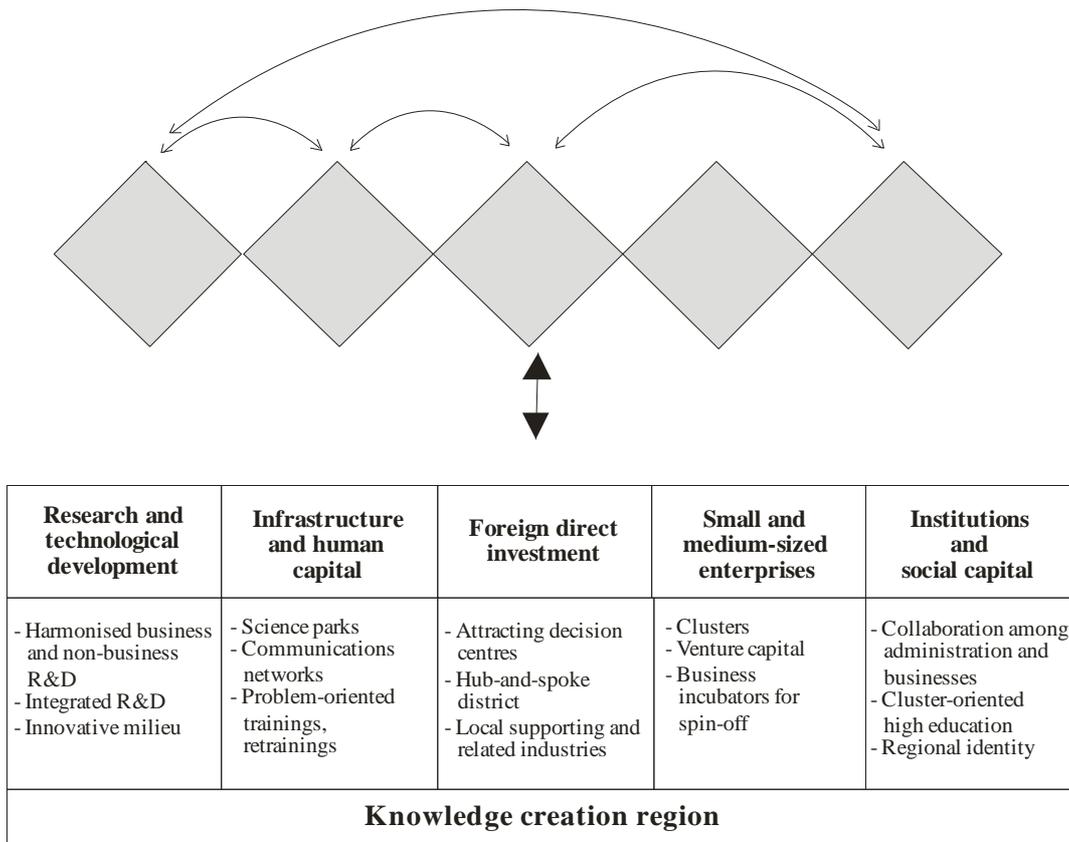
Figure 3. Bottom-up economic development of knowledge transfer region

Research and technological development	Infrastructure and human capital	Foreign direct investment	Small and medium-sized enterprises	Institutions and social capital
- Applied R&D - Coordinated R&D - Technology transfer	- Innovation centres, incubators - Business infrastructure - Task-oriented vocational trainings	- Supported investments - Satellite-Marshallian industrial district - Local value chains	- Horizontal networks - Business services for start-up - Trainings for managers	- Decentralized administration - High education by local business needs - Non-profit organisations
Knowledge transfer region				

Source: Lengyel 2003

3. **In knowledge creation regions** (region with relatively strong competitive potential) the source of permanent competitive edge is the creation of innovation results. The enterprises collaborate with universities successfully. There are several places where high-tech companies concentrate in science parks. The background basis of innovation is continuously and developed with high priority (e. g. universities). Locally developed technologies are utilized. The expected quality of university training programmes is high; the rate of highly qualified, creative workforce is also high. From lesser developed regions, the highly qualified workforce settles in this region. In this region third generation university functions are clearly present (Figure 4).

Figure 4. Bottom-up economic development of knowledge creation region

Research and technological development	Infrastructure and human capital	Foreign direct investment	Small and medium-sized enterprises	Institutions and social capital
- Harmonised business and non-business R&D - Integrated R&D - Innovative milieu	- Science parks - Communications networks - Problem-oriented trainings, retrainings	- Attracting decision centres - Hub-and-spoke district - Local supporting and related industries	- Clusters - Venture capital - Business incubators for spin-off	- Collaboration among administration and businesses - Cluster-oriented high education - Regional identity
Knowledge creation region				

Source: Lengyel 2003

1.2 *The competitive role of universities in different types of regions*

The results above outline a very important thing: The challenges of the knowledge-based economy can only be successfully dealt with if we sharply separate the regions where knowledge creation occurs from the ones where knowledge is utilized, as this fundamentally determines their future opportunities. This logic is in harmony with Porter's (and the WEF's) three region types, as in the innovation-driven phase the competitive edge is gained from the creation of knowledge, whilst in the investment-driven regions it is gained from utilizing knowledge.
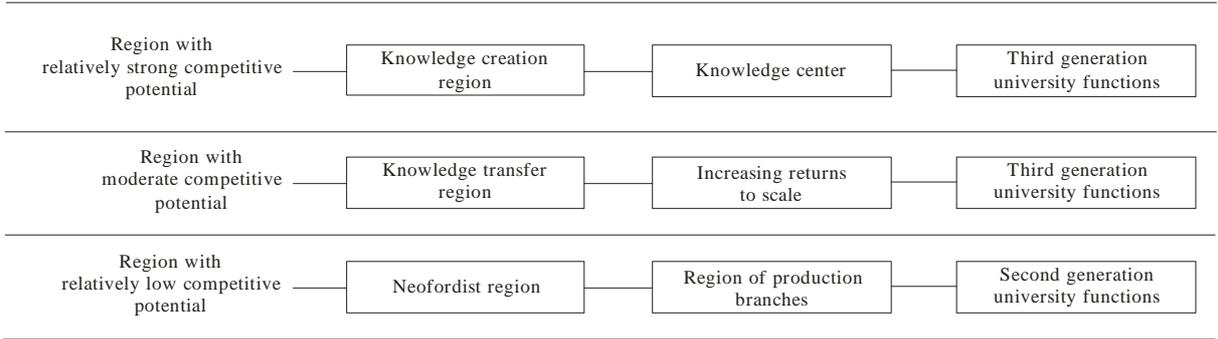
Some regions with relatively low competitive potential lack the critical mass of knowledge-based economic factors (size of city, preparedness of workforce, standards of infrastructure), innovational capacity, specialization, capacity and standards of higher education etc.

In knowledge-based economies the economic role of each region type is different, a **reorganization of regional division of labor** can be noticed (Lengyel 2003). The opportunity of regional development depends mainly on the „**critical mass**", essentially the advantages of the agglomeration. For this reason during the analysis of regional competitiveness it is practical to separate regions along urban and rural dimensions. This comes from the realization that the knowledge-based sectors **demand special conditions and environment**, from which one of the most important things is the proximity to knowledge bases that can only be observed in urban areas (Begg 2002).

The role of universities is different depending on the type of region in which they are located. Resulting from the previously mentioned facts, the different types of demonstrational

models and the different versions of the regional competitiveness hat, we can clearly deduce that universities have different roles regarding the enhancement of competitiveness in regions with different competitive potential. The stronger the competitive potential of the region, the stronger third generation university functions are expected to be present: universities have better and more sophisticated connections with the actors from industry, they have training programmes that are oriented around local needs and input and output levels of university are also higher. In contrast, in regions with relatively low competitive potential the presence of second generation university functions is sufficient. The role of the university is education and research; however it is does not consider the needs of local entrepreneurs (Figure 5).

*Figure 5.* Functions of universities based on the type of competition

Region with relatively strong competitive potential	Knowledge creation region	Knowledge center	Third generation university functions
Region with moderate competitive potential	Knowledge transfer region	Increasing returns to scale	Third generation university functions
Region with relatively low competitive potential	Neofordist region	Region of production branches	Second generation university functions

Source: Self-edited

2 The effects of universities regarding economic development

To effectively reconsider the effects of universities regarding regions, at first it is practical to frame out the logical structure of concepts (Figure 6). The role of universities from an economic aspect has been widely analyzed. The definition of competitiveness has a clear relevancy in this contexture. We should conceive the logical structure of economic development as a point of origin. According to this the main goal of economic development is to increase the welfare of the inhabitants of the region through competitiveness (or productivity according to Porter) and counting on the ability of innovation (Lengyel 2003).

Figure 6. The logical structure of regional economic development

Target ⟶ Prosperity

Means ⟶ Competitiveness (Productivity)

+

Basis ⟶ Endowments
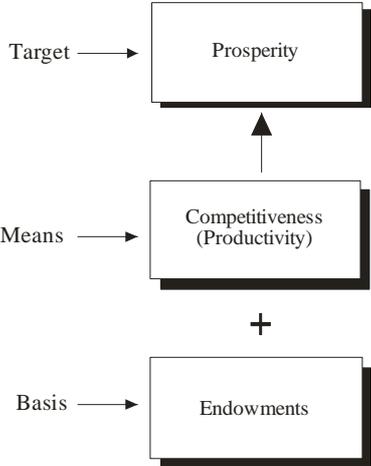
Source: Lengyel (2002)

The effects of universities on economy can be categorized in two groups (Lengyel 2008): Short-term input effects and long-term output effects (Figure 7). Universities spend a significant amount of money to maintain and operate its own buildings. These services are ordered from local enterprises. The students, professors and research associates also spend some part of their earnings locally. The presence of the university urges local services and this increases the income of governments and generates demand towards public services.

The short-term effects of the university (input side) affect the demand of local enterprises, the income and expenses of local households and the services and income of local governments.

Thanks to universities, young and highly qualified graduates appear on the labor market. The local workforce is able to easily start new enterprises due to the recently acquired skills and abilities, thus institutes of education increase the appeal towards entrepreneurship. The freshly graduated workforce can attract enterprises from outside the region which leads to the establishment of new workplaces. The professors and researches of the university practice significant R&D activities (Lengyel 2008).

The long-term effects of universities (output side) can affect the qualification of human capital, the attraction of foreign capital and workforce into the proximity of the university and the number of enterprises based on university research.

The input factors can be considered as triggers of secondary regional multiplier effects of the economic base model, as they vivify demand regarding local services. However this demand does not generate substantive economic growth and barely creates new workplaces.

The output factors trigger primary multiplier effects. New companies could come into existence that can create new workplaces in the region and are able to acquire income from outside the region.

Figure 7. The local economic effects of universities
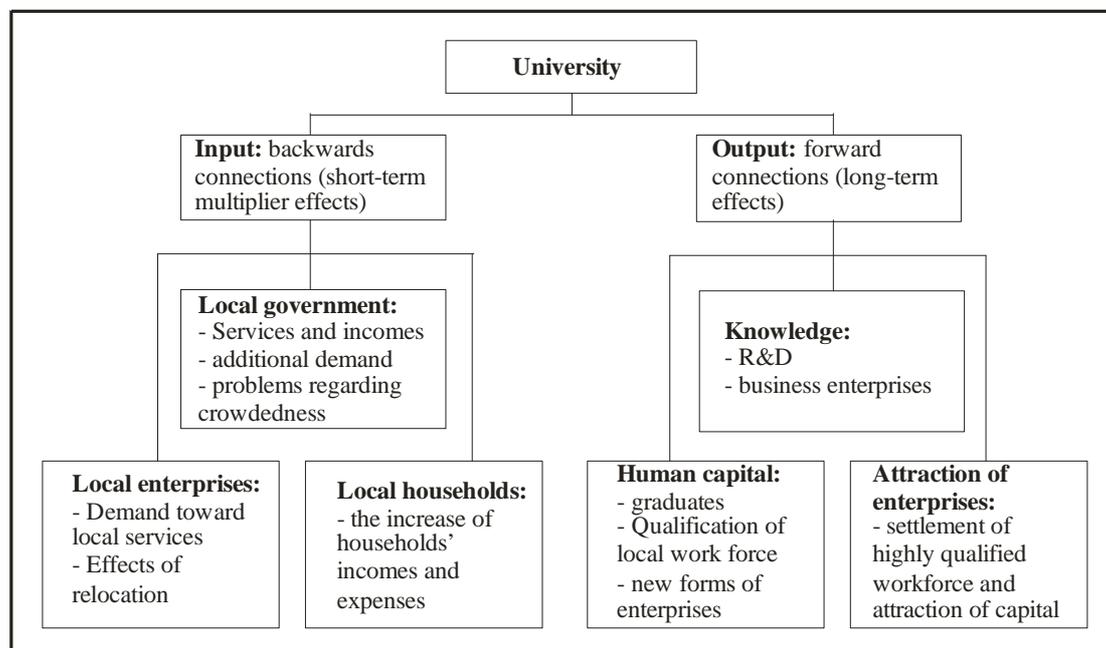
Source: Lengyel (2008)

The goal of Goldstein and Renault (2004) was to measure the contribution of universities to regional development and to attempt to separate the economic effects of universities' functions. The range of the analysis was the 312 metropolitan statistical areas of the USA from periods 1969-1986 and 1988-1998. The main unit of regional economic

development is the annual average income per capita. To eliminate macroeconomic changes the average earnings of each area has been divided by the average earning of the USA in the same year and made as a percentile value. The dependent variable was composed of indices the difference of two following years.

The regional presence of universities is measured by four different variables. The first variable demonstrates if there are any universities in the region that are among the 50 best research universities in the proper period. The second variable demonstrates the sum of research expenditures of the region's universities. The third variable demonstrates the number of annual degrees given by all institutions of higher education of the region. The fourth variable demonstrates the patents owned by universities in a certain region.

The authors defined control variables that help to explain the occurring changes in economic welfare of the region. These were the type of region representing the employment (small, medium, large), the geographical position of the region (Northeast, Central West, South, and West), the economic structure (processing industry, services), the accessibility (large, medium or small airport), entrepreneurial activities (incomes, patents) and the average earnings of a certain base year.

As a result of the research, the conclusion is that (Goldstein-Renault 2004): The research universities significantly contribute to economic development in the second period. Between the two periods the Bayh-Dole Act, that was accepted in 1980, started to have an effect so universities had the opportunity to possess intellectual ownership regarding their public funded research results. The research and development activities stimulate the economy more intensely patenting or license activities. Though patents are closer to economic utilization, the research and development expenditures have a far more significant effect. As the aggregated knowledge reaches economy through several channels, the R&D expenditures have effects through informal channels too. There is a negative connection regarding the labor market of graduates, as it represented certain fullness in the latter period. The more the number of graduates, the less the income, which is imputable to the fact that graduates bring down each other's opportunities, so the wages decrease. The only regional type where the presence of research universities is demonstrable is the micro-region, as the universities act as substitutes for urban agglomeration and they ensure several external effects.

The methodology of Goldstein and Renault has been applied to Hungarian micro-regions by Zoltán Bajmócy, Miklós Lukovics and Zsófia Vas. They determined that the conclusions of Goldstein and Renault cannot be proven regarding Hungarian micro-regions and the innovational effects of universities in Hungary are insignificant (Bajmócy et al 2009).

The universities and research facilities can significantly affect the development and competitive edge of a region directly and indirectly, besides it is often pointed out that the educational and research activities of the university can only be effectively optimized when their results are utilized by the economy, hence they can enhance economy (Bajmócy 2006).

According to Wissema (2009) nowadays the second big transition of universities takes places, which trend to the formation of so called **third generation universities** (Table 1). In this phase, universities not only create professionals (first generation universities), professionals and scientists (second generation universities), but **professionals, scientists and entrepreneurs** at the same time (third generation universities).

Table 1. Some characteristics of first, second and third generation universities

Aspect	First generation universities	Second generation universities	Third generation universities
Goal	Education	Education and research	Education, research and utilization of knowledge
Role	Protection of truth	The cognition of nature	Creation of added value
Output	Professionals	Professionals and scientists	Professionals, scientists and entrepreneurs
Language	Latin	National	English
Management	Chancellor	Part-time scientists	Professional management

Source: Self-edited based on Wissema (2009)

We can state that the enhancement of the competitiveness of a region can be expected from third generation universities, as this is where not only education and research are significant but the utilization of knowledge is also crucial. As a result the connection between industry and universities deepens, so there is an opportunity of the local utilization of knowledge created in universities, which enhances the competitiveness of the region through the enhancement of the competitiveness of enterprises.

3   The local economic and social environment of universities

Knowledge-based society inevitably involves the appraisement of human capital, as the competitiveness of economies highly depend on the quantity and quality of human resources available. The key elements of training human capital are universities, which have an increasing role in developed economies.

3.1   Fourth generation universities

It is typical in regions with developed economic background that universities progressively augment their traditional activities (education and research) with third mission elements due to their increased role in society and economy.

Nowadays modern universities have to fulfill the needs and demands of knowledge-based society. The modern, international acknowledged universities are exceptionally attached to the local economy; they have day-to-day relations with local actors. A question inevitably emerges: what conditions must universities fulfill to be able to evolve locally and create and maintain a global presence? Three approaches help us to answer this question: fourth generation universities, the diamond model of universities and the Triple Helix model.

Besides the well-known typology of Wissema that mentions three generations of universities, there is a new, fourth generation approach present in literature. The accurate characteristics of fourth generation universities are in an embryonic stage, their attributes require consideration. The fourth generation university fits properly in the progress of university development. The most significant difference is that these universities have a much more notable strategic approach and they are able to shape their environment proactively (Pawlowski 2009).

3.2   The diamond model of modern universities

In accordance with the Porter diamond model that systematizes the microeconomic business environment of enterprises, we can state that the success of universities depends on

several factors. We are able to translate the determinants of the original diamond model in the context of universities. With this we can define the factors contributing to universities' competitive edge (Figure 8). The determinants necessarily include updated content.

Figure 8. The diamond model of modern universities
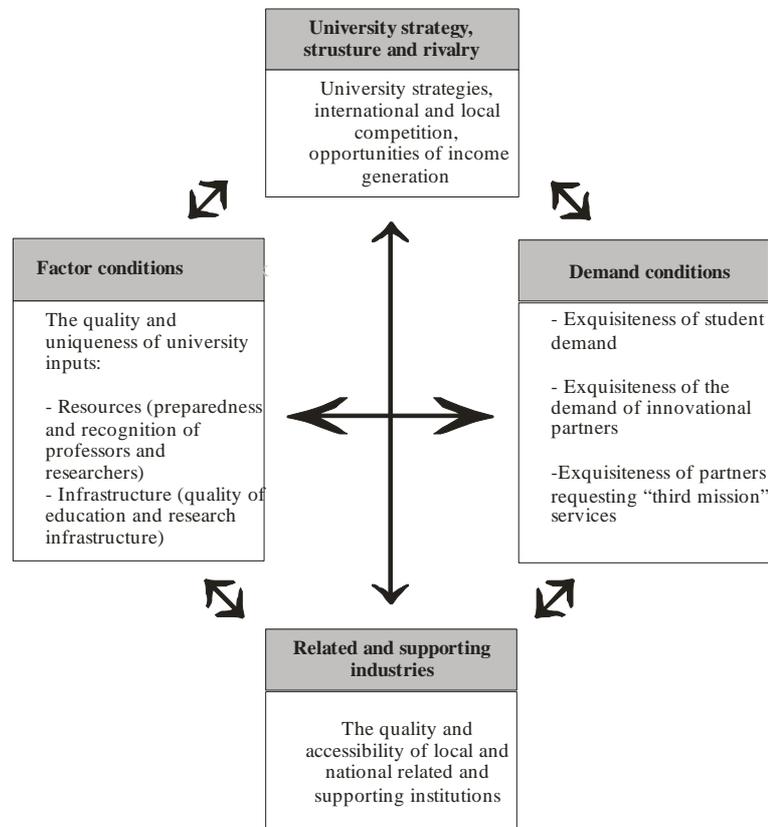
In connection with **factor conditions** the human resources and infrastructure have the greatest significance, so here we can highlight the importance of both **hard** and **soft** elements. Here those factors are located that serve as a foundation of the competitiveness of universities. If professors are more qualified and if the infrastructure is more modern, the universities can accomplish a better position on the virtual global rankings of universities.

Demand conditions mean demand for all factors that serve as an output of the university. The sophisticated local demand motivates the universities from aspects of education, research and third mission. These are necessary but not sufficient requirements of internationally recognized competitiveness. In accordance with the input side it is important that highly qualified graduates with sophisticated knowledge should appear on the labor market on the output side. Demand conditions determine both quantity (critical mass of students) and quality (correspondence with students' needs) dimensions. It is also important to be able to attract the best national and foreign students.

Related and supporting industries determine partners that can contribute to the success of universities directly or indirectly. Universities tend to have strong relations with the business sector and other universities or research facilities.

In connection with **university structure and rivalry** it is fundamental that institutional documents should be written reckoning the characteristics of the local area, as this is a crucial element of success.

3.3   The connections between universities, industry and government

The main approach of the Triple Helix concept is that the actors of the university-industry-government triangle share some of their activities with each other; however we are able to distinguish their main functions (Etzkowitz 2008). This connection results in a novel approach on a regional level which can act as a foundation of knowledge-based economy and cognition. In the Triple Helix model the university possesses the main role of education, government is an actor of social aspects and industry acts as engine of economy. On the whole we can point out that the Triple Helix model highlights the creative role of universities in regional economies (Gunasekara 2004).

Within the framework of third mission, developing the economy and enhancing competitiveness are becoming fundamental activities. To achieve this, universities must target the creation and intensification of networks towards economy and government. This trilateral network system is called Triple Helix model (Lengyel B. 2004).

Universities ought to create strong collaborations with actors of economy and government. This is inevitable and necessary from the aspect of regional development (Lengyel 2004). As a result of the close connection of the university and the industrial sector, the created knowledge can be locally utilized so it can contribute to the competitive edge of local enterprises, and through this it can also contribute to the competitiveness of the region (Lukovics 2010). Nowadays more and more institutions of higher education want to be the part of this process; they urge progress in development as a central motivational force.

As a result of education, universities train highly qualified workforce, they create new possibilities during research. The common part of the two procedures is that with them we are able to shape the future considering present needs (Boulton – Lucas 2011). They managed to do this for a long time, however nowadays these activities gain more attention. The global higher education rankings record and measure their success and activities. Through benchmarks they give excellent practical examples.

As a standard, universities have a fundamental role in the Triple Helix model. However the activities represented by universities are revalorizing. Besides we must point out that the creation and maintenance of knowledge-based economy would be constantly clogging.

4   The components of a successful fourth generation university

As a result of analyzing the competitive role, the potential economic development effects and the economic-social environment of universities we can create the virtual model of successful fourth generation universities.

The characteristics of successful universities can be determined, as the contemporary global higher education rankings have their own criteria and methodology regarding successful universities from the aspect of education and research. The success factors in connection with third mission can also be determined through the analysis of university strategies[3].

The feature of the model is that is systematizes and demonstrates the success factors determined by global higher education rankings and international benchmarks. The virtual model is located in a local area, as the embedment in local economy and society is a necessary

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[3] In connection with the virtual model represented in the study, we must point out that the analysis of university strategies is the work of Gabriella Molnár. The virtual model of an internationally successful university was jointly created by Bence Zuti and Gabriella Molnár and the related study has been awarded 2nd prize at the Regional Studies II division during the Economy Section of the 31st National Scientific Students' Associations Conference.

but not sufficient factor of success. The foundation of the model is composed by the determinants of the diamond model of universities. This basically determines the effective operation of the university (e. g. the profitability of financial resources, highly educated human capital and infrastructure). The two pillars represent the traditional activities of education-research and third mission. In these pillars the most important success components are represented, that contribute to the efficient operation of the university if integrated properly. The education-research pillar and third mission pillar both consist of 4-4 components. It is important to point out that the location of these components within the pillars is not hierarchic.

The first component of the **education-research pillar** is **mobility**. When discussing mobility we can talk about student and research associate dimensions. With internationalization a fourth generation university has to support mobility of students. The possession of a wide system of networks is necessary to ensure opportunities and mobility programs for students with adequate financial sponsorship. Besides openness regarding foreign students is also important.

The second component of the pillar is the **programme portfolio** consisting of BA/BSc, MA/MSc and PhD programmes, vocational trainings. In connection with the programme portfolio we can highlight two extreme dimensions, which are „pull" and „push" cases. The **pull approach** means that the demand is given, so the programme portfolio adapts to this demand. The **push approach** means the opposite, namely that the institution creates the demand for the portfolio.

The third component of the pillar is **innovation**. Besides education, research is a fundamental activity in the everyday life of universities. In case of a fourth generation university it is important that research results should possess significant practical value and with it we should be able to solve real problems. Nowadays constant innovation, new ideas and solutions are inevitable, as they can be key aspects of the success of enterprises. Through excellent quality research and continuous innovation the university can contribute to the development and support of regional enterprises.

The fourth and final component of the education-research pillar is **parameters and performance** which can be connected to all of the indicators of global higher education rankings.

The first component of the **third mission pillar** is **transfers**. We can distinguish knowledge transfer and technology transfer. The approach of knowledge transfer trends towards tacit, while technology transfer trends to codified knowledge and the flow of information.

The second component of the pillar is **connections**. We can discuss internal and external. Internal connections on national level mean connections of university-industry-government (Triple Helix model), while external conditions are determined as international networking activities from the aspect of the university-industry-government. It can be advantageous if they manage to connect with business actors and local organizations. In this case the induction of significant economic effects emerges as a primary goal.

The third component of the pillar is the **adaptive structure and system**. This can be defined as a flexible organizational structure that considers planning, organizing, directing and monitoring in a way that recognizes the most efficient operation opportunities in the local area.

The fourth component of the third mission pillar is **services**. As a result, universities can widen their basis of income, besides it can contribute to the development of local economy, moreover it can support and improve enterprises with activities like counseling.

As a result, we can create the virtual model of modern universities (Figure 9).

Figure 9. Virtual model of an internationally successful university
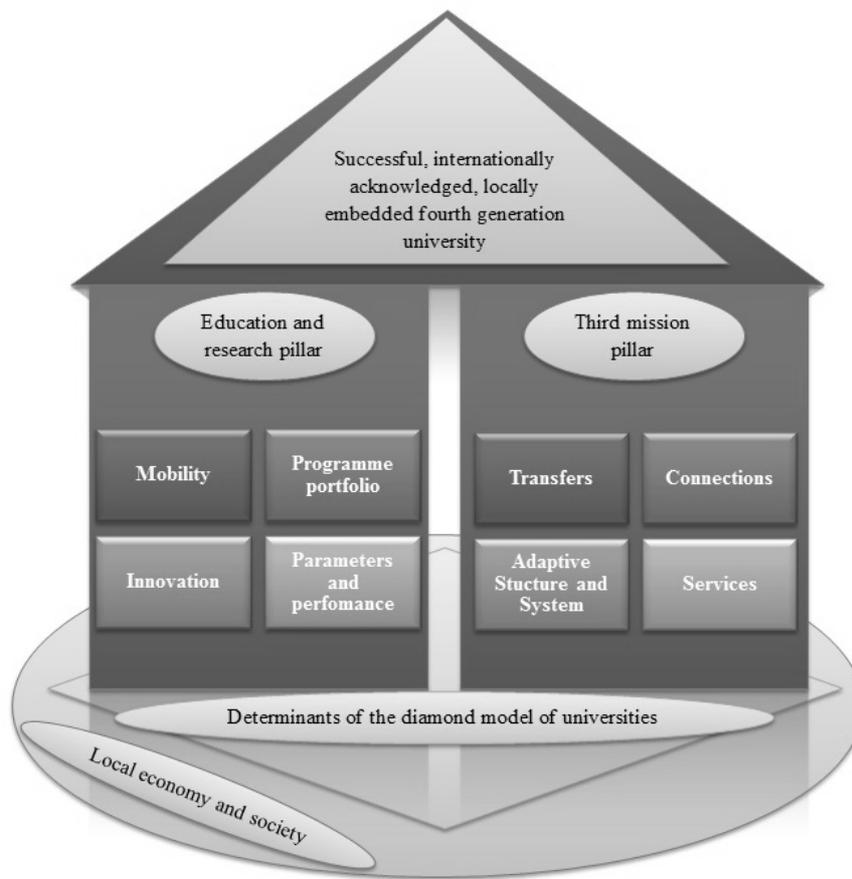
Source: Self-edited

The top element of the virtual model is the strategic goal of the university, namely the achievement of international acknowledgement, local embedment within the framework of fourth generation universities. The vision of modern universities is the attainment and maintenance of national and global welfare through the successful adaptation of this framework The concept of a successful, locally integrated fourth generation university gives an answer to the question „What?", however the question „How?" remains open. This can be solved and answered by adapting the ultimate strategic goal considering the characteristics of the local economy and society, namely we reconfigure the added value of universities regarding the attributes of the local area.

5   Conclusion

The main goal of this sturdy was to answer the proposed problem: **what the universities can do (by representing active or passive behavior) for the purpose of enhancing regional competitiveness?**

To answer this question, we divided our study into four main parts. First we examined the connections between universities and competitiveness with the help of the pyramid model of regional competitiveness and region-specific UFO-models. Afterwards we discussed the potential economic development effects of universities that concern input and output factors. Then we analyzed the economic and social environment of universities with the diamond model of modern universities and the Triple Helix model. This was done in the context of fourth generation universities. Finally we introduced the virtual model of an internationally

successful modern university that consists of success components. These components can contribute to the optimization of local opportunities so universities can gain international acknowledgment. By following this framework universities may affect and enhance the competitiveness of a region.

An appropriate answer can be given regarding the proposed problem: universities are able to positively contribute to the competitiveness of their regions by considering strategic thinking and third mission activities with the help of tools of economic development. It is important to highlight that the model introduced in the study is a framework that is able to foster the contribution of universities regarding local economic development. The most appropriate results may materialize if the university recognizes and considers the needs of local economy and society.

The society and economy is in a transition from quantity production to quality production. In this paradigm shift creative society has the best chance of shaping the future through universities.

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