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The Readiness to Cooperate Within the Triple Helix Model in Poland

Keywords: readiness; cooperation; science; business; administration

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Abstract

Theoretical background: The present article focuses on the assessment of the readiness of representatives of science, business and local administration in Poland to establish mutual cooperation in the areas of leadership, management style, competences and technologies. Subject literature refers to the cooperation of these three spheres as the triple helix. The literature, however, still lacks an assessment of readiness to cooperate from the perspective of science, business and administration. This article belongs to the area of institutional economics.

Purpose of the article: The main purpose of this article was to present the functioning of cooperation between representatives of science, business and administration in Lublin and Warsaw. The methodological purpose was to develop the proprietary methodology of readiness to function according to the Triple Helix Readiness concept as a tool for assessing the level of readiness of the scientific, business and administration environment for mutual cooperation in Polish cities. The empirical purpose was to evaluate Polish cities in terms of their preparation for cooperation, as well as to formulate recommendations for the science, business and administration environment focused on increasing the effectiveness of mutual cooperation.

Research methods: Qualitative and quantitative research methods were selected. Among the qualitative methods, a diagnostic survey was used. The Computer-Assisted Self Interviewing (CASI) online survey

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technique was also used, which is in line with the quantitative methodology of market and opinion research. The tool used to conduct the research was an Internet questionnaire addressed to stakeholders. For the present article we adopted the assumption that the adaptation of the modified Net Readiness methodology will enable us to assess the level of readiness of the science, business and administration environments in Poland to establish mutual cooperation. The author modified the original Net Readiness methodology for the purposes of conducting the research.
Main findings: The adopted research hypothesis: cooperation between science, business and administration is determined by various factors. Diversification of the level of cooperation depends on the management style, leadership, level of competence and technology advancement used. The results of our research indicate that the readiness to cooperate with external entities depends on many factors. From the perspective of enterprises, these include the level of advancement of information systems, modern tools supporting knowledge management, their research and development activities, registered and transferred patents, trademarks and training expenditure. On the other hand, universities pay attention to the possibility of commercializing their solutions and later marketing them. Still other factors determine the readiness to undertake such cooperation on the part of cities and towns. The main added value of this article is that it adds to the scientific output an assessment of the readiness of the scientific, business and administration communities to cooperate under the triple helix model and recommendations focusing on increasing the effectiveness of their mutual cooperation.

Introduction

Nowadays, building the competitiveness of a region requires not only supporting entrepreneurship, research, development activities and the cooperation between these entities, but, above all, creating an efficiently functioning system including all entities that contribute to increasing the investment attractiveness of modern business service centres. Establishing cooperation between science, business and administration dominates discussions on the creation of a knowledge-based economy, the main feature of which is the ability to constantly introduce innovations through the commercialization of knowledge. What remains prerequisite for the proper functioning of the connections at the level of science and business in accordance with the triple helix model, are actions of public entities, especially local government units. By creating conditions for creating networks, local authorities stimulate the flow of knowledge. They are the entity responsible for the development of the knowledge-based economy and the constant improvement of the innovation level of the respective area. The attention is focused on enterprises, while the scientific and administrative environments assume a supporting role towards innovative processes developed in companies that invest their capital in a selected location. The direction of cooperation is also determined by the inflow of foreign investors, who establish relations with entities of the local economy, namely universities and administrative authorities. Years of our experience demonstrate that cooperation between science, business and administration proves difficult to organize. There are differences in the areas of scientific research, scientific experiments, which are the domain of scientists, striving for an economic surplus, focusing on expanding the market by entrepreneurs and creating favourable conditions for living in the city, where road infrastructure, access to utilities and other municipal investments are of great importance, including, among

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others, renovation of historic buildings and restoring tourist locations (Matusiak, 2010), carried out by city offices. Cooperation between the centres of science and business is stimulated by factors related to the globalization and internationalization of technological knowledge. Scientific and technological knowledge may be available in any enterprise in the short-term rather than the long-term perspective (Trzmielak, Grzegorczyk, & Gregor, 2016).

The competitive environment requires looking for unconventional solutions in the relations between science and business, which will allow one to build a competitive advantage of local manufacturing systems. The economy is based on innovative capabilities that depend on network-organized cooperation with the characteristics of regional systems linking the science, business and local administration environments. The result is the development of a regional partnership for the economy and the formation of cooperation based on the triple helix concept, i.e. a system based on the cooperation of entities representing the three environments: public administration, science and business. The subject literature coined the term "triple helix" for cooperation of these three spheres, and the triple helix theory refers to a chain consisting of spirally coiled and complementary chains characterizing a particular model of cooperation (Bednarzewska, 2016). In the framework of such cooperation, the representatives of each of the respective circles bring certain resources, expecting added value from the cooperation undertaken, as listed in Table 1.

Table 1. Resources and expected benefits of cooperation stakeholders

	Resources	Expectations
Universities	Knowledge New technologies Human capital Creative ideas Laboratories and research infrastructure	Commercialization of research results Orders for services and specialist expertise Research funding Employment for graduates
Local authorities	Initiative and coordination of activities Statutory financing Public procurement Support programmes Public services	Dynamization of development processes Increase in tax revenues New jobs Improving their competitive position Improving the image of region/city
Businesses	Capacity to take risks Markets, distribution channels Investments	New products and technologies Skilled labour force Profit participation Improving infrastructure

Source: Author's own study based on (Matusiak, 2010; Bednarzewska, 2016).

Literature review

The cooperation process is based on the cooperation of entities representing three different environments: public administration, science and business or industry. Subject literature refers to the cooperation of these three spheres as the triple helix. The "triple helix" is a term referring to the double-helix model of DNA structure,

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i.e. two chains that wrap in spiral around a common axis, as suggested in 1953 by Watson and Crick (1953). The term "helix" itself comes from mathematics and denotes a helical line in the form of a three-dimensional curve. The subject literature suggested concepts for modelling processes taking place in the system consisting of: administration (authorities) – science – industry. Relationships between public administration, science and industry can adopt various forms. Etzkowitz and Leydesdorff (2000) distinguished three basic types of interactions between the afore-listed entities:

1. The etatist model of the public administration – science – industry relationship, which describes the situation in which the public authority sector encompasses the scientific and industrial environment, also managing their mutual relations.

2. The *laissez-faire* model consists of three distinct spheres: public administration – science – industry, with clear boundaries and very limited relations between them.

3. The triple helix model is a model of interaction of triple helix areas (Etzkowitz, 2007).

The difference between these two terms is quite significant as the actual helix model is three-dimensional. Etzkowitz noted that the triple helix model has three dimensions:

> 1. Internal transformations in the entities of each of the three nodes, it may consist of development of dependencies between industrial enterprises in the company, e.g. alliances or clusters, or an increase in the economic mission of universities.
>
> 2. The impact of the entities of one node on the entities of another node, e.g. influencing the behaviour of enterprises and scientific entities in the field of knowledge, technology and information flow through industrial or scientific policy.
>
> 3. Creation of new network structures in the result of the interactions between all nodes in order to generate new ideas, especially high-tech ones, e.g. in the form of clusters. (Skawińska & Zalewski, 2009)

However, the model described by Etzkowitz lacks precise indicators and measurement techniques, the complement of which can be found in other fields of science. Field theory, sourced from physics, was applied to create a triple helix analysis method that could serve as the basis for future studies of triple helix interactions (Zhou, 2001). Field theory presents a triple helix with the core of the inner and outerfield space. The field interaction model explains why these three spheres maintain a relatively independent and separate status, while also demonstrating where their interactions take place, and why the dynamics of the triple helix model can be constructed with a gradation between independence and interdependence: conflicts and intertwining of interests. The university may play an industrial role in the technology transfer process, but not as a real enterprise. The same goes for industry and government. Industry may form academic teaching and research entities, but is unlikely to stray far from its core mission. The institutional sphere may lose its separate character if it does not maintain its relative independence. For example, scientifically-oriented start-ups, or set up microcompanies, may focus solely on

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research and lose their market position. This is very difficult for the sphere in the outer space of the field because the confusion of functions or roles inevitably leads to disturbances in the system.

According to Etzkowitz and Leydesdorff (2000), the triple helix is a method of analyzing innovation that fits the concept of a knowledge-based economy. The Internet renders these connections global and, thus, they should be treated as factors in the dynamics of a more complex system. Innovation is the result of a complex interaction between the concept of an invention, its implementation and dissemination, and the political power that creates general conditions in this system (Bogdanienko, 2012). According to Brandenburg and Sekuła (2013), constructing a knowledge-based economy is possible when the potential of partners from science, business and administration environments is combined. Joint action and striving to achieve the set objectives is carried out according to the concept of the "golden triangle" or the concept of a "triple helix" (Etzkowitz, 2002).

Cooperation between the centres of science and business is stimulated by factors related to the globalization and internationalization of technological knowledge. Scientific and technological knowledge may be available in any enterprise in the short-term rather than the long-term perspective (Trzmielak, Grzegorczyk, & Gregor, 2016). The issue of cooperation between the two environments is discussed from a global and national perspective. Havas (2012) distinguished five cooperation strategies for global companies in the area of their cooperation with scientific and research entities. These strategies are:

- a production strategy based on the production of goods or services without any research and development cooperation outside the country of company's registered address,
- a strategy of contracting research and development, focused on conducting research, technology development based on lower research costs, without production for the local market, the cooperation itself is conditioned by the implementation of the project carried out by the parent company,
- a strategy for research and development contracts coupled with a production strategy focused on research and technology development at lower research and production costs on the local market,
- a strategy for production and research and development that takes into account the production of goods and services based on scientific and research cooperation in a country other than that of the company's headquarters,
- a research and development integration strategy integrating the research work of a global company and universities on a markets other than that of the company's headquarters.

Strategies based on bilateral relations between universities and business, business and government authorities, and universities and city authorities, consequently led to the creation of tripartite cooperation. The triple helix model has its source in the publications by Sábato and Botana (1968). The authors pointed to the adoption of

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the paradigm of innovation development by using relations between government authorities, the production sector and the science and technology sector. Relations between the three entities are realized through the following dependencies:

- internal for each entity individually,
- external between the three entities,
- external of triple helix entity and another organization,
- external entities of more than one triple helix entity and another organization (Trzmielak, Grzegorczyk, & Gregor, 2016).

The internal relations play a crucial role in the ability of the respective entities to support processes connected with fostering transfer and commercialization of knowledge within the framework of their mutual relations. Etzkowitz and Leydesdorff (2000) argue that the main objectives of the triple helix model are communication and expectations, transforming institutional arrangements between universities, industry and government. This statement is further elaborated by Leydesdorff and Meyer (2003), who point out that the triple helix model tries to capture the dynamics of communication and organization by introducing the concept of overlapping relationships and exchanging feedback on institutional arrangements (*ibid*.).

The entities operating in the product and service distribution channel have an impact on the relationship between the science and business environment. Suppliers and recipients who cooperate with universities and business representatives have a particular impact on the relationship between science and business. In conditions of efficient cooperation of the science community with business and local authorities, business with science and local administration, as well as local authorities with universities and entrepreneurs, relations of mutual influence appear (Trzmielak, Grzegorczyk, & Gregor, 2016). This theory enables us to explain the cooperation of three independent entities: universities, industry and government authorities, which can bring benefits to each of the parties involved.

The state of cooperation between the scientific and business community in Europe was presented in the report of the European Commission (Davey, Meerman, Galán-Muros, Orazbayeva, & Baaken, 2018), using data obtained from respondents in European countries. The results presented by the European Commission show that both the representatives of science and business believe that the area of research is more developed than the area of education. University representatives also noticed the least developed areas and at a very similar level of development. These include valorisation activities and the management area. Valorisation activities relate to the commercialisation of knowledge emerging from an HEI such as "commercialisation of R&D", "academic entrepreneurship" and "student entrepreneurship". Management activities relate to illustrate a more strategic nature to cooperation between HEIs and business with the activities grouped into three categories: "governance", "shared resources" and "industry support".

In order to emphasize the scope of the positive impact of cooperation between science, business and administration, it is also worth recalling the research conducted

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in Germany in the context of the impact of stakeholders in the development of innovation policy criteria for the development of renewable energy (RES). It manifests itself through the creation of cooperative systems, the generation and transfer of knowledge, and the development of urban location factors. Each stakeholder contributes differently to the RES policy (Visintainer Lerman, Gerstlberger, Ferreira Lima, & Frank, 2021).

The importance of the functioning of the triple helix is important in many European countries. The author's research was focused on the local dimension – selected Polish cities.

Research methods

The methodological purpose was to develop the proprietary methodology of readiness to function according to the concept of the triple helix (triple helix readiness) as a tool for assessing the level of readiness of the science, business and administration environment for mutual cooperation between cities in Poland. The empirical purpose was to evaluate selected Polish cities in terms of their preparation for cooperation, as well as to formulate recommendations for the science, business and administration environment focused on increasing the effectiveness of mutual cooperation. Qualitative and quantitative research methods were selected. Among the qualitative methods, a diagnostic survey was used. The Computer-Assisted Self Interviewing (CASI) online survey technique was also used, which is in line with the quantitative methodology of market and opinion research. The tool used to conduct the research was an online questionnaire addressed to stakeholders (universities, enterprises, city offices). The questionnaire consisted of three parts:

- a sensitivity grid, thanks to which the entities assessed the degree of cooperation regarding projects implemented between the administration, science and business communities in individual cities,
- an advancement test focusing on 9 areas related to the conditions determining the advancement of cooperation,
- a readiness assessment sheet consisting of the areas of leadership, management style, competencies and technology. It was treated as a measure of the preparation of the scientific, business and local administration environment to use economic conditions in order to establish and expand cooperation, which proves the readiness to implement the model based on the triple helix concept. The questionnaire was supplemented with a certificate.

The analysis of the current condition of cooperation development, and the indication of directions for further improvement of this process in Poland, require the selection and application of new research methods and techniques. One such method is the organization's net readiness (NR) methodology. This methodology, in its original form, was developed in 1999 by Cisco Systems analysts – Hartman,

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Sifonis and Kador (2001). Four elements were defined in the methodology: leadership, management style, competences and technologies, which determine the ability of enterprises to effectively operate in e-business and implement projects that have a very significant impact on the shape of their organization (*ibid*.). For the purposes of our study on cooperation between the science, business and administration environments in Poland, we decided to analyze the attitudes of respondents in the areas of leadership, management style, competences and technology. The study applied arithmetic means for each group of entities in the respective criterion. In every city subjected to our analysis, and for each of the entities, in all four studied areas: leadership, management style, competences and technologies, arithmetic means were calculated, e.g. for leadership, the respondents assessed five factors determining their readiness to cooperate.

Potential differences in the attitudes of particular groups of entities formed an additional area for our analysis. The results scored by the cities were compared to the ideal model as a model of perfect cooperation. The model (perfect) reference level adopted by the author is a value equal to 5 and was determined on the basis of the 5-point Likert scale used in this part of the questionnaire. If the respondent provided the highest scoring answer (marking the maximum values) in all the questions of the researched area (leadership, management style, competences and technology), the mean of these responses would equal 5. The author considers this level to be the model one and it will be referred to as the perfect model in further part of the present article. By determining such a maximum (benchmark) level, it is possible to determine the differences (gaps) between the obtained average value of points in the respective area and the perfect level for each of the studied entities (cities, universities, businesses). Determining the ratings for the respective entities also gives us the opportunity to perform an in-depth analysis, i.e. to identify and discuss the differences between entities in a given location. The obtained results were presented in terms of quantity and percentages (where the value of 5 is 100%). Using the Likert scale, the respondents could indicate the following answers: 1, 2, 3, 4 or 5, i.e. 1 – is the minimum value, and 5 – is the maximum value that could be indicated. The distance between the two extreme values is 4. It was assumed that the respective distances between the indications (values) on the scale are:

2 – 1 = 1, i.e. 25% of the scale,
3 – 1 = 2, i.e. 50% of the scale,
4 – 1 = 3, i.e. 75% of the scale,
5 – 1 = 4, which is 100% of the scale.

The results were presented as absolute (numerical) values and for ease of comparison – in relative values (%). The analysis was carried out individually for each city.

In order to conduct the research, three survey questionnaires were elaborated, each divided into three parts: the sensitivity grid, the advancement test and the readiness assessment chart. The respondent's particulars were elaborated separately for each of the environments. The survey questionnaire was divided into three

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parts in accordance with the Net Readiness methodology. In the proprietary triple helix readiness concept, the areas of leadership, management style, competence and technology were treated as a measure of preparedness of the science, business and administration environments to use economic conditions to establish and expand cooperation, demonstrating their readiness to implement the model based on the triple helix concept. We used the test results from the readiness assessment sheet to determine the level of readiness for cooperation.

Results

Provincial cities such as Lublin and Warsaw were selected for the research sample. These cities represent the central-eastern Poland.

In Lublin, questionnaires were completed by the Lublin City Hall, Maria Curie-Skłodowska University (5 questionnaires), John Paul II Catholic University of Lublin (4 questionnaires), Lublin University of Technology (6 questionnaires) and the Medical University (4 questionnaires). The business community was represented in the research by 23 entities from the external business services industry. When assessing the level of preparedness to undertake external cooperation, the entities used a division into the areas of leadership, management style, competences and technology. Cities are characterized by their high distance from the model (i.e. value equal to 5). Indications of individual responses allowed us to notice that, both in the area of management style and technology, the gap was 55%. These deviations may be caused by barriers resulting from the disruption of the administrative process of work organization in the field of cooperation projects, or the lack of stable indicators allowing for the assessment of the impact of the effects of implementation of projects coordinated by a city. Leadership and competences are also an area that still requires improvement.

Universities are distanced from the model in the area of leadership – by 39.25%, technology – by 39%, management style – by 37.75% and competences – by 36.50%. University representatives point to the lack of incentives to initiate cooperation, the flow of information on offers, terms of joint ventures, or the lack of uniform contract templates. The universities also noticed that each of the entities cares only about their own interests, and not about the synergy effect, which is caused by the different mentality of people representing particular groups of stakeholders. These results also demonstrate that the activities undertaken with the participation of universities are ineffective. The universities noted the high level of bureaucracy in their science-administration relations. The business environment is the most distant from the model in the area of management style (47.50%), followed by leadership (36%), technology (34%) and competencies (28.75%). Respondents from that group indicate that the support of local authorities and universities in making investment decisions is important, however, additional factors encouraging investments are also costs of

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running a business and access to the Special Economic Zone. The differences in the preparation of their areas in individual environments may be due to the different perception of cooperation and its significance for the development of the respective entity. The most similar level of preparation for functioning in a cooperation network is characteristic of city authorities and enterprises. The difference in responses in the area of leadership is only 1%, with the highest differences recorded for technology (21%). The results are presented in Table 2.

Table 2. Comparison of the assessment of readiness to cooperate in Lublin

Criteria	Ratings of individual entities			Perfect model	Deviations from the perfect model in absolute (numerical) values			Deviations from the perfect model in relative terms		
	City	Universities	Business		City	Universities	Business	City	Universities	Business
Leadership	3.60	3.43	3.56	5.00	1.40	1.57	1.44	35.00%	39.25%	36.00%
Management style	2.80	3.49	3.10	5.00	2.20	1.51	1.90	55.00%	37.75%	47.50%
Competencies	3.40	3.54	3.85	5.00	1.60	1.46	1.15	40.00%	36.50%	28.75%
Technology	2.80	3.44	3.64	5.00	2.20	1.56	1.36	55.00%	39.00%	34.00%

Criteria	Distances between entities in absolute (numerical) values			Distances between entities in relative terms		
	City – Universities	City – Business	Universities – Business	City – Universities	City – Business	Universities – Business
Leadership	0.17	0.04	0.13	4.25%	1.00%	3.25%
Management style	0.69	0.30	0.39	17.25%	7.50%	9.75%
Competencies	0.14	0.45	0.31	3.50%	11.25%	7.75%
Technology	0.64	0.84	0.20	16.00%	21.00%	5.00%

Note: $N_c = 1$, $N_u = 19$, $N_b = 23$ (c – city, u – universities, b – business).

Source: Author's own study.

The entities in Warsaw were represented by the Warsaw City Hall, the University of Warsaw, the Warsaw University of Technology, the Warsaw School of Economics, the Warsaw University of Life Sciences and ten representatives of the business process outsourcing industry. Analyzing the results, we can conclude that the city authorities efficiently implement a cooperation policy, and are well prepared for it. Slight deviations from the model concern leadership (5%), technology (10%) and competences (15%). Only the management style of the capital of Poland was assessed as exemplary. This cannot be stated in the case of universities, where the gaps in the respective areas range from 37.5 to 46.25%. The results, proving certain barriers to cooperation, are also noticeable in case of representatives of businesses. These gaps are, successively – in descending order: 25.5% for technology, 25% for leadership, 23.5% for the management style and 19.5% for the competences. We analyzed the differences in the development of individual areas as assessed by the city and the

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universities. It can be seen that these entities differ in the implementation of certain assumptions of cooperation, and these differences range from 30% in the area of competences to 37.5% in the area of management. It is worth pointing out that the entities that should significantly adjust the scope of their competences and technologies are universities, the level of which differs significantly from the reference values adopted for the model. In the case of the city and business representatives, there are clear differences in the management style that amounted to 23.5%. This suggests the business should improve their cooperation competences in this area. When comparing the results of science and business, different levels of development in the area of competences are noticeable, and the respondents' responses differ by 25.5%. The most important action aimed at tightening relationships is to maintain the best result in the intergroup comparison and eliminate disproportions between the entities (Table 3).

Table 3. Comparison of the assessment of readiness to cooperate in Warsaw

Criteria	Ratings of individual entities			Perfect model	Deviations from the perfect model in absolute (numerical) values			Deviations from the perfect model in relative terms		
	City	Universities	Business		City	Universities	Business	City	Universities	Business
Leadership	4.80	3.40	4.00	5.00	0.20	1.60	1.00	5.00%	40.00%	25.00%
Management style	5.00	3.50	4.06	5.00	0.00	1.50	0.94	0.00%	37.50%	23.50%
Competencies	4.40	3.20	4.22	5.00	0.60	1.80	0.78	15.00%	45.00%	19.50%
Technology	4.60	3.15	3.98	5.00	0.40	1.85	1.02	10.00%	46.25%	25.50%

Criteria	Distances between entities in absolute (numerical) values			Distances between entities in relative terms		
	City – Universities	City – Business	Universities – Business	City – Universities	City – Business	Universities – Business
Leadership	1.40	0.80	0.60	35.00%	20.00%	15.00%
Management style	1.50	0.94	0.56	37.50%	23.50%	14.00%
Competencies	1.20	0.18	1.02	30.00%	4.50%	25.50%
Technology	1.45	0.62	0.83	36.25%	15.50%	20.75%

Note: $N_c = 1$, $N_u = 4$, $N_b = 10$.

Source: Author's own study.

What was interesting from the point of view of scientific research, was to formulate recommendations for the science, business and administration environment focused on increasing the effectiveness of their mutual cooperation. Applying some improvements in this area could increase the competitiveness of the respective city. It was decided to present three main recommendations for each of the environments and to indicate three areas that are important for the entire cooperation system (Figure 1).

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Figure 1. Recommendations

Source: Author's own study.

Discussion

On the basis of the acquired research results, we can formulate recommendations regarding activities that the entities involved in the cooperation process should focus on. Barriers that inhibit cooperation indicated by the entities covered by the study are issues connected with financial liquidity, technological facilities, lack of trust in partners and inefficient flow of information regarding cooperation proposals. City halls should focus their attention on developing a system that would enable the measurement of effectiveness and implemented projects. Introduction of implemented projects plans and measurable expectations that could be generated by their implementation seems to offer a good solution in this respect. The cities should focus on specifying those aspects that would actually increase their competitiveness and foster a positive investment image of the respective location. City halls in Poland should support the innovation policy based on priority industries, whose development drives the local

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economy. They should monitor the number of implemented patents and inventions. Only practical solutions based on supporting key industries of the city can be a factor which can increase its attractiveness from the point of view of foreign investors. Each city has a specialization in which it invests. In this industry there are enterprises that operate, and the universities educate their students in areas which should increase their chances in the job market. The development of city specialization, understood as priority industries, depends on the inflow of labour, access to infrastructure and natural resources. The specializations of cities focus on advanced industrial, aviation and IT technologies, business services and the agricultural industry. Cities, based on supporting and developing individual sectors of the economy, increase their chances for the inflow of foreign direct investments that determine the development of the respective industry. City offices should be more flexible in the implementation of projects involving external entities. Each of them is guided by slightly different objectives, especially in terms of the expected results, resources allocated for a given purpose, both tangible ones and those related to know-how. City halls hold fairly formalized procedures for the implementation of projects, which do not always provide for changes that involve the involvement of partners in cooperation, for example, in the form of altering deadlines, project feasibility or financial outlays.

Universities face the same problem as city offices. It concerns the lack of a system that would enable controlling the effectiveness of joint ventures. Universities should be oriented not only towards their theoretical foundations, but, above all, towards practical solutions that could be implemented in local economies, supporting their development and increasing their competitiveness. Currently, following recent legal changes, universities are mainly guided by scoring points for parametric assessment granted for submission of patents. This is not always reflected by the actual implementation of such a solution, which translates into a persistently low rate of their practical applications. In order to build a bridge between science and business, universities should adapt their specializations to the trends dictated by the market. This will improve the job opportunities for the graduates, as their education will be in line with the qualifications and expectations of the economy, and will contribute to the strengthening of relations between the entities. Enterprises of the new economy expect new, often very specialized skills from their employees. In order to create a certain bridge between theory and practice, universities should be oriented towards increasing the practical aspects included in their curricula. Poland is the fourth country in Europe in terms of the number of students, but universities must still adapt better to market demands. In Poland, there are more and more people with higher education who work in low-paid jobs. One of the reasons for this may be that universities fail to adequately prepare students to enter the job market. A better understanding of future employers' expectations of students will help universities adapt the curricula in such a way, as to make it easier for their graduates to find a job. In the case of postgraduate education, entrepreneurs expect personalized programs tailored to their internal needs and strategies.

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The recommendations that have been formulated for business representatives include those focused on the effect measurement area of tripartite cooperation and also control. Enterprises implementing joint ventures are not always driven by the priority they have in their perception. It is often so that for some of the investors this cooperation forms the background for their core business, as they are guided by the principle saying joint ventures represent a certain added value, yet most of the company's activities are not oriented towards establishing external relations. Enterprises feel appreciated by city authorities, which as part of creating a friendly investment climate include investors in a cooperation network, for example, by inviting them to joint meetings on the development of the respective industry. The support also consists in assisting in the selection of land for investments, clarification of legal and tax issues as well as promotional activities. It can be concluded that entrepreneurs often join the cooperation system with the motives of shaping their image in the environment, as part of their public relations. A good practice would be to implement a system of indicators that would provide information on the measurable effects of cooperation, and, thus, translate into the competitiveness of enterprises, not only in their image dimension. An important tip is also the launch of control activities that would provide some improvement in the implementation of cooperation and give it a higher rank in the operations of companies. Currently, cooperation is treated as a side activity in business operations. Recommended actions also include development of a strategy for establishing and maintaining external relations, in which objectives of tactical relevance, with a temporal perspective of 3 to 5 years, are included. The assumed objectives would allow the implementation of the area, which would increase the chance of acquiring qualified staff with skills dedicated to the needs of enterprises. This would help to avoid the migration of employees to other cities or countries.

Conclusions

In summary, the areas that require improvement in order to increase the efficiency of cooperation are: development of a system for measuring effectiveness, increasing flexibility in adapting to the often diversified expectations of partners and developing strategies. Activities aimed at elimination of gaps at the interface between science, business and local administration could raise the investment image of the city, and, thus, its competitiveness compared to other economies. Cooperation can be used as a bargaining power in perceiving the city as a mature investment location.

Warsaw achieved much better results in the field of cooperation between science, business and administration. The capital of Poland has greater opportunities to establish external relations, which translates into management efficiency, high competences and advanced technologies. In the comparative analysis, Lublin achieved weaker results.

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Lublin is a smaller academic center, therefore, it should use the current potential with the use of current solutions, such as the establishment of the Lublin Academic College. The college is to be a platform for cooperation between universities, local governments and business. Currently, Lublin is a city of nine universities. Lublin's universities and colleges are characterized, together with Warsaw, by the highest internationalization index in the country.

Lublin should take advantage of Warsaw's best practices. Many research teams do not want to conduct research in the areas indicated by business. What is more, it happens that when choosing a research area, scientists do not check the possible applications of their work or carry out those that have been abandoned or verified abroad a long time ago.

Cooperation with business also destroys the model and pace of work they know. In establishing creative cooperation with stakeholders, the need to build relationships with specific people is important. This solution is more effective, at least initially, than establishing official inter-institutional cooperation. Secondly, it is worth inviting representatives of various centers to projects in order to be able to choose the best ones. Third, when there are problems, it is a good idea to reach out to decision makers who can help find a solution that satisfies all parties.

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