SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 189

RELATIONSHIP BETWEEN UNIVERSITY AND BUSINESS: COOPERATION OR COLLABORATION?

Lilla KNOP[1*], Katarzyna PAPIEŻ-PAWEŁCZAK[2]

[1] Silesian University of Technology; lilla.knop@polsl.pl, ORCID: 0000-0001-6796-7695
[2] SPIN-US Sp. z o.o.; katarzyna.papiez-pawelczak@us.edu.pl, ORCID: 0000-0003-4189-9721
* Correspondence author

Purpose: The purpose of the study is to perform the assessment of developmental level of cooperation/collaboration between Polish universities and the business. The basis of research is the concept assessing the level of integration starting from identification and/or creation of networks till the organizations of collaboration.
Design/methodology/approach: The article is a conceptual analysis of the maturity of university-business collaboration development.
Findings: Based on the process of cooperation development, assumptions were presented to assess the maturity of collaboration between universities and business. The proposed cooperation maturity model between a university and business is a solution based on the network integration process and description of such network discriminants as: network governance, value (network rent), structuralism, network competences.
Originality/value: Well-founded collaboration mechanism, stimulating the pursuit for perfection has a significant meaning for the creation of new knowledge within the scope of general development of a society based on science and studies and for the innovation systems. Being traditional and single projects oriented, it has its unquestioned benefits however, it poses problems not only for the new developed ideas exceeding beyond the limits of the existing well defined domains and scope but also for new and emerging technologies. Cooperation between the universities and business striving for collaboration based on better understanding of commercialization processes of the research results, their innovativeness and adaptation to the needs of the economy and society

Keywords: university - business relationship, collaboration, cooperation.

Category of the paper: Viewpoint.

1. Introduction

The process of applying and using research and development studies in the business, as well as conducting activities aimed at spreading knowledge and technology (and their corresponding patent and license services) should become the important factors of new strategies and

institutional programmes of universities. Direct relationships with the industry, based on contract and advisory research, are established. In most cases, the problem is specified by the industry and the role of a university is to offer solutions to these problems. Unfortunately, such a cooperation is often limited to short-term problems. As a result, it is not bound by long-term strategy and research agenda which would be based on a well-defined technological strategy (Gebhardt et al., 2021). This mostly applies to small and medium-sized enterprises (SMEs) which additionally face the problem of finding a suitable partner at a given university (which is perceived as a large and complex entity).

Collaboration between universities and the industry sector is an element of a sustainable system of the national innovation system and cannot be aimed at disregarding any of these entities (Kempton et al., 2013; Cloutier et al., 2019). It is necessary to accept the fact that both of the partners in such a collaboration have different motivations and goals. Different features characterizing such partners lead to a necessity of such collaboration to be managed, coordinated or moderated in order to ensure added value for each of the partners. That is why collaboration should be interpreted as a complex communication process between two different worlds with different systems of goals, rationalities, knowledge and different approaches to management, values and interests. A well established and consolidated collaboration mechanism, stimulating striving for perfection bears a significant value for the creation of new knowledge (within the scope of general development of a society based on science and studies) and for the innovation systems (Guimón, 2013). Traditional, single-project oriented collaboration mechanism has its unquestioned benefits, however it raises problems not only for the new ideas which are being developed within the well-known and elaborately described fields, but also for new, emerging technologies.

The adopted assumption states that the basis for science-business relationship is the attainment of mature cooperation with elements of collaboration. The article consists of three parts:

- in the first one the literature analysis was made, considering the difference between cooperation and collaboration;
- in the second part the cooperation maturity model which characterises science-business relation was proposed;
- the third one evaluates the maturity of science-business cooperation in Poland.

The purpose of this article is to assess the level of advancement of cooperation between Polish universities and the industry. The basis for this research is the concept which differentiates the level of integration from identification and/or creation of network of organizations with the aim to collaborate. The originality of the discussion in the article includes, on the one hand, the distinction in the science-business relationship between the issues of collaboration and cooperation. On the other hand, an attempt was made to present the level of maturity of science-business collaboration in Polish conditions.

2. Cooperation and Collaboration within inter-organizational networks. Literature Review

Discussion about the difference between cooperation and collaboration is often of intuitive nature, however for many researchers these terms remain indistinguishable. The difference becomes apparent when we picture the issue against the background of network considerations, which create a particular process of maturation of cooperation between these organizations. Along with that, the recognition that networks are not only the domain of management studies is essential. Network approach is being used in mathematical sciences (graph theory and neural networks), sociology (social networks), geography (networks in economic geography), management (business networks and strategic networks), and economics (regional development theory, network effects, and spatial economics). Considerations on inter-organizational networks have been conducted for several decades. Scholars and professionals both have shown a keen interest in inter-organizational collaboration for more than 25 years (Le Pennec, Rauffle, 2018). Easton and Araujo (Easton, Araujo, 1996) and Grandori and Soda (Grandori, Soda, 1995) have identified almost 20 different approaches or schools in inter-organizational networks. As Möller and Rajala (Möller, Rajala, 2007) point out "This great diversity in network research produced important new knowledge but also, unfortunately, resulted in conceptual confusion of the core phenomenon itself". Research led by Czakon & Kawa (Czakon, Kawa, 2018), Olko (Olko, 2023) confirm that. Interdisciplinarity allows for better understanding of the problem of inter-organizational cooperation which grew on (Ratajczak-Mrozek, 2017):

- social exchange theory (Blau, 1968; Cook, Emerson 1978, Granovetter, 1973);
- interorganizational theory (Thompson, 1978; Brunson, 182; Gulati, Garigulo, 1999);
- new institutionalism with some general economic studies (Penrose, 1959; Richardson, 1972).

As it has been emphasised, various theories influenced understanding and development of the network approach. Numerous social and behavioural studies are important sources of inspiration. In the research on networks there are noticeable links towards inter-institutional theory and institutionalism. Fundamentals in microeconomic theory (Williamson, 1975) had a significant influence on the development of the network approach. Even if the transaction-based approach initially overlooked relationships, its purpose was to explain phenomena similar to the network approach, i.e. economic exchange (Coase, 1937). Since the late 80's of the last century, researchers have been recognising enterprises as conditioned by the network of relations, not as a completely autonomous entity (Czakon, 2012). Therefore, the key to consider the networks is relations the essence and functions of which are presented in Figure 1.

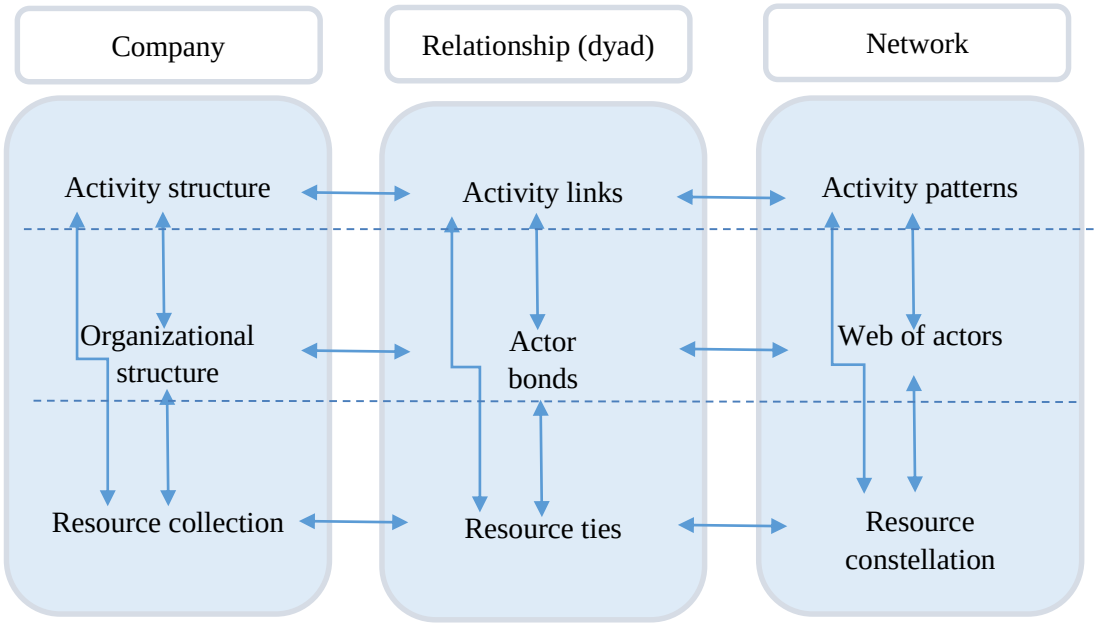

Figure 1. From company to network - critical issues in coping with business relationships.
Source: Håkansson, Snehota, 1995, p. 47.

To describe the relations, three interrelated perspectives (enabling the creation of description) of the relationships are being used. In case of a single enterprise, actions are being undertaken within the limits of its structure (using accumulated resources). Bilateral relations are based on related operations which use connections (often formal) between the actors and connections between the resources. In case of networks, we deal with models of enterprises based on constellation of available resources and network of actors. For each of the layers in the model a set of basic propositions is offered and a number of empirically based conclusions about the nature of interaction are drawn, such as about resource interaction as an evolutionary process, about activity interaction as balancing processes and about actor interaction in a narrow and wider network context (Håkansson, Snehota, 1995).

Detailed considerations on inter-organizational cooperation are being based on a few theories:

- transaction cost theory (Williamson, 1975),
- the resource-based view (Pfeffer, Salancik, 1978; Barney, 1991),
- the theory of industrial organization (Tirole, 1988),
- the theory of competitive positioning (Porter, 1980),
- the network theory (Borgatti, Foster, 2003).

Using these theories in practice assumes that the inter-organizational networks are usually associated with additional possibilities of gaining strategic advantage. Arguments for improvement of strategic position of the network, and separately its entities, are i.e.: full and fast information flow between the apexes of the network (Miles et al., 1978), better, than in case of individual organizations, access to rare and valuable resources (Gulati, Garigulo, 1999),

occurrence of synergistic effect in collective actions (Burt, 2002), benefits resulting from exchange of knowledge and experiences, obtaining a network rent (Niemczyk, 2013).

Inter-organizational networks - just like organizations - are prone to changes over time. This is related to maturation of networks, especially in terms of cooperation. Studies on the networks and their level of maturity were presented by Schöttle (Schöttle et al., 2014). Based on the literature, they distinguished the following factors estimating the maturity of cooperation: willingness to compromise, communication, commitment, trust, transparency/ information exchange, knowledge sharing, willingness of client to take risk, independences between partners, control, coordination, conflict potential. An interesting interpretation of maturation of inter-organizational networks was presented by Machnik-Słomka & Kordel (Machnik-Słomka, Kordel, 2012). In their opinion, the inter-organizational networks at the emergence stage are characterised by searching for the inter-organizational connections and complementary resources for identifying, designing and implementing the inter-organizational value creation chains. Seed networks are characterised by new value creation chains, undeveloped inter-organizational relations structure, high fluctuation of networks' entities, implementation of radical changes, presence of highly developed technologies and high uncertainty both in the field of actions undertaken and the entities themselves. The inter-organizational networks tend - at the stage of growth - to focus on reinforcing and rising the efficiency of already existing value creation chains, rather than searching for the new ones. Growth networks are characterised by developed value creation chains with a big growth potential, stable structure of the inter-organizational relations, implementation of incremental innovations and stability of the behaviour of networks' entities (Knop, Brzóska, 2016). Mature networks are created by well-defined and consolidated value creation chains with low growth potential. Entities of such networks are very well distinguished (well-established leaders of networks appear), structure of inter-organizational relations is firmly solidified, applied technologies are mature, management procedures become consolidated and later on reproduced behaviour patterns.

More synthetic analysis of networks was presented by Czakon (Cakon, 2015). According to his assumptions, network research is characterized by specific features. The first of them is the view on networks from the perspective of network governance, so-called multiple coordination (Czakon, 2008). In the pure form, this characteristic means intentional forming of coordination mechanisms of many actors. Cooperation leads to formulation of an opinion that „strategy in the network approach is a collection of actions oriented at optimal contract management from the point of view of the stakeholders" (Niemczyk, 2013). The second characteristic is the network rent (Niemczyk, 2013) which is oriented at identification of: achievable surplus resulting from functioning in the network, sources of this surplus, methods of protecting it from copying by competitors, methods of appropriating it by companies. Networks in that area open brand new exploration field. Sources of advantage move from the inside of organization to outside of it where they focus, among others, on: individual

connections, their systems and ways of organizing the cooperation. The third characteristic takes the sociological perspective through an analogy to social networks and close connection with human economic activity (Granovetter, 1985). The discriminant can be described as structuralism because it examines such measures of the networks as: size of the network – measured by number of nodes, – density of the network – measured by number of connections, and heterogeneity – measured by diversity of nodes and connections. The fourth characteristic of the networks research – as stated by Czakon – is seeking for the competences of forming the relations with surroundings of sources of competitive advantage (Klimas, 2013; Stachowicz-Stanusch, Aleksander, 2017).

Slightly different approach in the research was proposed by Camarinha-Matos (Camarinha-Matos et al., 2008). Characteristics of maturation of the cooperation process, as a part of the inter-organizational network, was measured by them primarily with the indicator of integration (see Figure 2). The assumptions of such approach were used in the further part of the article, focusing on the development of networks' characteristics as well.

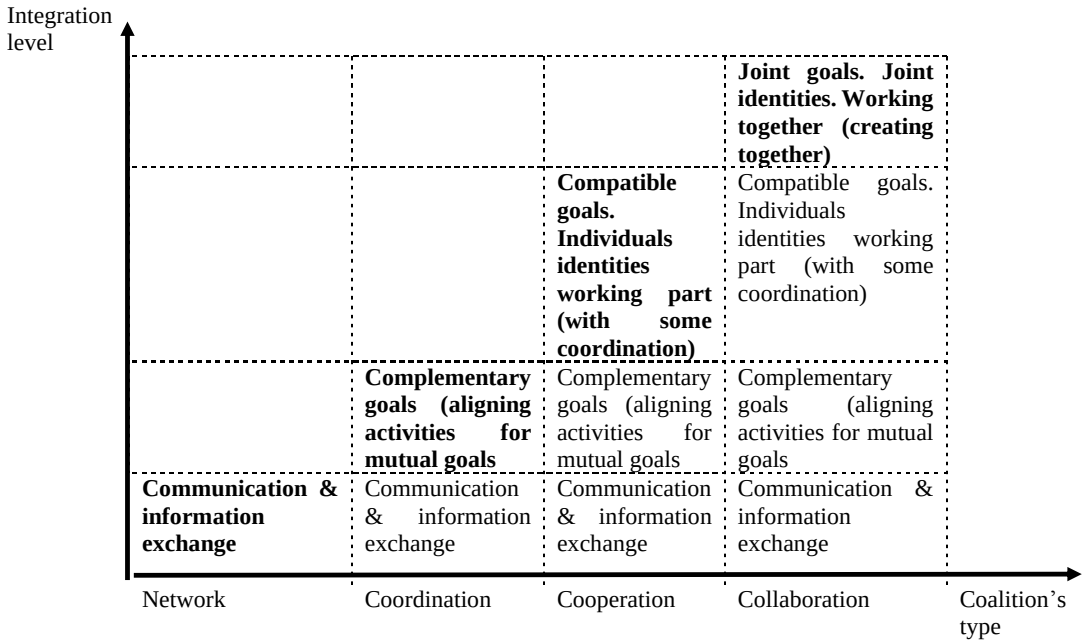

Figure 2. Interaction maturity levels.

Source: Camarinha-Matos et al., 2008.

Using the model presented on the figure, each of the maturity stages of cooperation covers (Polenske, 2004; Camarinha-Matos, Afsarmanesh, 2008, Czakon, 2015, Amici, Bietti, 2015; Kotzab et al., 2019; Wankmüller, Reiner, 2020). Ghasemi et al., 2023):

– Networking - at the initial stage of network cooperation, we deal with development of communication process and information exchange oriented on mutual benefits. This is the time for identification of entities functioning in the network, development of tools aiming for the information exchange, presentation of offers, organization of seminars and conferences oriented on realisation of shared activities. There doesn't

necessarily exist a common goal or structure which influences the participation of individual members, therefore there is no shared value generation. At this stage we study parameters of the network and asses the possibility of creating network competences.

- Coordination of the network – in addition to information exchange, at this stage, coordinated actions are proposed in order to achieve more effective results. Cooperation that has been undertaken within the network adopts certain organizational forms, common associations are being instituted, coordinator is being appointed or constituted, tasks are being assigned to complementary contractors. Coordination is an act of harmonious cooperation, searching for common suppliers, creating a business support system, organising cyclical meetings, indicating the fields of common actions. However, it is assumed that each entity may have a different goal and use its own resources and methods for value creation. Network structuralism is being strengthened.
- Cooperation - includes not only information exchange and adaptation of actions, but also sharing the resources in order to achieve consistent goals. Cooperation is being achieved by division of tasks and resources exchange. In this case, aggregated value is the result of addition of specific „components" of values generated by various participants in a quasi-independent manner. Traditional supply chain based on relations with suppliers and predefined roles in the value chain is an example of the process of cooperation between its components. Each participant does his/her part of work in a quasi-independent manner (although coordinated with others). There is a common cooperation development program that assumes realisation of common projects. The role of coordinator is strengthened and individual goals are compatible in such a way, that their results may be added or created in the value chain leading to the final product or service.
- Collaboration - a process in which entities share their information, resources and responsibilities in order to plan, implement and evaluate actions together with the aim to achieve a common goal. This concept is perceived as a process of joint creation; the process in which a group of entities increases their capabilities. This means sharing the risk, resources, responsibilities and rewards. Cooperation includes mutual involvement of participants in order to solve the problem together (which embodies mutual trust and therefore requires time, effort and dedication). Individual contribution in value creation is hard to determine. The effect of the functioning of the network is visible and the individual contribution into creating the value is much more difficult to determine.

Research on inter-organizational collaboration has focused on two main areas (Le Pennec, Raufflet, 2018):

- organizational motivations for collaborating: organizational image, knowledge transfer and creation, innovation, access to networks, market intelligence;
- identification of key success factors.

Based on the idea of learning through collaboration and cooperation some researchers define inter-organizational collaboration and inter-organizational cooperation differently, showing the differences between these terms. Inter-organizational collaboration refers to relations between business partners wherein each company attains benefits and learns from the partners in order to achieve their goals more effectively. Within the scope of the inter-organizational collaboration, the companies remain autonomous and their relations can be broken any time without an impact on the goals of single companies. In case of the inter-organizational cooperation, the companies cooperate in order to achieve a common goal. In such relations, none of the parties can effectively compete without a continuous input of the remaining partners (Albani, Dietz, 2009). Roschelle & Teasley (Roschelle, Teasley, 1995) describe cooperative work as a task that is accomplished by dividing it among participants, where "each person is responsible for a portion of the problem solving," and they see the collaborative work as "the mutual engagement of participants in a coordinated effort to solve the problem together". Following this path, we try to understand the differences between cooperation and collaboration. Interesting research results in this area are presented by Schöttle (Schöttle et al., 2014), who have analysed over 40 papers in order to compare the terms cooperation and collaboration. Table 1. presents the research results and differentiates some criterions of comparison between these two terms.

Table 1.
Comparison of the terms: cooperation and collaboration

Main criteria	Cooperation	Collaboration
Authority	Retained by each organization	Determined by new structure
Control	Central	Shared and mutual
Cost affection	Lower transaction costs	Lower adaptation costs
Economies of scale	External	External
Information	Exchange according to needs	Key, shared and using
Leadership	Unilateral	Dispersed, supportive
Organization	Separated	New and jointly developed
Planning	Separately	More comprehensive
Relationship	Informal	Informal and formal
Resources	Separated	Pooled and shared
Rewards	Separate	Shared
Risk	Virtually no risk	Pooled and shared
Structure	Less flexible, not commonly defined	New and clearly defined, jointly developed, shared
Trust	Not necessary	Necessary
Value generation	By various participants	Jointly
Vision/mission/goal	Independent	Common

Source: Schöttle et al., 2014.

While reviewing international literature, we can find various definitions of the word „cooperation" referring to the words used in English language interchangeably – "cooperation" and "collaboration". Mattessich and Monsey (Mattessich, Monsey, 1992) define cooperation as „informal relations which exist without any common mission, structure or effort of planning", whilst collaboration is perceived as „separated organizations with new structure and full

commitment towards common mission". Others describe collaboration as „creating dynamic links without the need for having a predefined role structure" (Sioutis, Tweedale, 2006). While analysing the table, we compare two columns which describe Cooperative Network and Collaborative Network. In the first one, we can find: information exchange, communication, compatible goal (which according to the definition of Polish Language Dictionary means „capable of interacting with another factor, element, without causing interference; complementary; compatible with something"), on which each entity works independently, with the element of the whole process coordination, designed by one entity, which requires low level of cooperation. Kumar & van Dissel (Kumar, van Dissel, 1996) assume that an increased level of independence enhances conflict potential which results in the need of coordination. This means that cooperation has a higher conflict potential than collaboration - because the level of independence in cooperation is higher than in collaboration. The second column represents Collaborative Network - a higher level - characterized by common goal, interactive contribution of participants, high quality relationships between the stakeholders. It is a process in which the entities share their information and resources with an intention to reach the common goal. When the process of common creation means risk sharing, it implies mutual trust, therefore requires time, effort and dedication. Such an approach may be an obstacle against quick reaction of e.g. research partner and while entering into cooperation with the industry. Collaboration level requires potential partners to be prepared beforehand and be able to participate in such a collaboration. Such readiness includes compatibility in terms of the usage of infrastructure, common operational rules and collaboration agreement. Collaboration is strongly correlated with „soft" characteristics. Trust, communication, commitment, knowledge sharing and information exchange are strong factors. This shows that collaboration will not occur immediately, automatically. It requires maturity both parties' maturity, development process, and is strongly connected with cultural factor based on relations and transparency of both parties (Gulati et al., 2012).

Some researchers take the hierarchical approach while defining these terms. They believe that collaboration describes relationships between partners whose tasks are already coordinated (here, coordination is sometimes perceived as a next step further, after cooperation). Different approach defines coordination and cooperation as the basis for collaboration because it offers the highest level of commitment, trust and information sharing. Sometimes the distinction of these terms is related to the level of trust and commitment, length, quality and proximity of relations, willingness to share the information and level of quality of common partnership in management. Therefore, we define the terms of cooperation and collaboration based on literature as follows:

- Cooperation is an interorganizational relationship between participants of a project, which are not commonly related by vision or mission. This results in a separate project organization with independent structures, where the project culture is based on control and coordination in order to solve problems independently and to maximize the value of the own organization.
- Collaboration is an interorganizational relationship with a common vision to create a common project organization with a mutually defined structure and a new (and jointly developed) project culture. This is based on trust and transparency; with the goal to jointly maximize the value for the customer by solving problems mutually through interactive processes, which are planned together and by sharing responsibilities, risk and rewards among the key participants.

In both of the cases above, we talk about the realization of common projects and the commitment of their actors. However, reaching the stage of collaboration requires major commitment from actors. It should be noted, that not every cooperation will turn into collaboration. There arises a question, is it possible in case of university-business cooperation?

3. Conceptual Framework

Engagement of the scientific participants and orientation on the needs of the economy is important and strongly underlined in the national and international policies, as well as in the new development programmes of research entities. Collaboration between universities and the industry sector must become a closely specified part of the institutional mission and the organizational development plan of a university. It should be positively assessed when evaluating institutions and employees and it cannot hinder academic career paths. That is why a well-designed organizational support mechanism with an especially prepared interdisciplinary research plan is a chance for a long- term collaboration.

It is obvious that universities play the key role in the social and economic development of both countries and regions. Evidence suggests that a successful mobilization of the university's resources may have a disproportionately positive impact on the national and regional economics as well as on the comprehensive strategies of development. The bigger the aspiration of a university to become a world-class one, the more it is willing to engage in global projects in terms of dimension and character. In this area certain models characterising universities have emerged (Guimón, 2013):

- Leading American and British universities conduct researches on global civilization challenges. This is a part of their tradition but it also contributes to their position in rankings, ensures high level of publication citation and creates competitive advantages that are particularly important when the results of the research are patents, licenses and products for which the demand is global;
- Major part of European and Japanese universities engage in global scientific projects provided that the area of research is compatible with priority areas of national or regional economy development. Thanks to that, universities can count on support from national and regional research funds coming from both private and public sources.
- In certain, closed national systems, universities which are not considered as "elite" try to elevate their position by preparing a perfect didactic and research offer that is oriented towards foreign recipients and students. Their studies concentrate on regional issues.

The priorities and scope of university-industry collaboration differ significantly between developed and developing countries, as shown in Table 2.

Table 2.
Different priorities of universities at different stages of economic development

Type of university	Most developed countries	Least developed countries
Research University	– Research consortia and long term research partnerships to conduct frontier research	– Building absorptive capacity to adopt and diffuse already existing technologies – Focus on appropriate technologies to respond to local needs
Entrepreneurial University	– Spin-off companies, patent licensing – Entrepreneurship education	– Business incubation services – Entrepreneurship education
Teaching University	– Private participation in graduate programs – Joint supervision of PhD students	– Curricula development to improve undergraduate and graduate studies – Student internships

Source: Guimón, 2013.

According to the textbook S3 (Kempton et al., 2013), the concept of entrepreneurial discovery (Martínez-López, 2013), the exchange knowledge (Ankrah, Al-Tabbaa, 2015):

- Universities can play a key role in defining a regional S3 by contributing to a rigorous assessment of the region's knowledge assets, capabilities and competencies, including those embedded in the university's own departments as well as local businesses.
- Universities can contribute to the regional entrepreneurial discovery process by bringing global awareness and partnerships across regional borders into the frame through evidence-based identification of competitive advantages around which regional strategies and resources can be concentrated.
- Universities can provide a specialist research expertise and links to national and international networks of knowledge, becoming critical agents in the entrepreneurial discovery process and establishing whether a region has the assets needed to specialise in particular areas.

- Through their teaching programmes (including Continuing Professional Development and Lifelong Learning as well as under and post graduate courses) universities can enhance the skills and competencies of staff working in the field of economic development through training, consultancy services and supply of graduates, thus improving the capacity of the region to deliver S3.
- On the demand side, while a university or universities are located in a specific region there might be a limited absorptive capacity in local enterprises, especially SMEs or the branches of multinational companies with no local in-house R&D. Universities can contribute to a process of building capacity on the demand side through new businesses and student enterprises formation, and graduate placements as well as encouraging staff to actively engage in the cooperation with local businesses.
- In terms of institutional leadership and governance, particularly in regions where local government is fragmented and unable to act beyond its own immediate boundaries, universities as the key anchor institutions can play an important role in building the social relations which underpin the regional innovation system for the formulation and, in fact implementation of S3.
- Furthermore, in order to meet major societal challenges (that have both global and local dimensions), such as how to move towards a low carbon economy or how to meet the needs and realise the opportunities of ageing population, universities can contribute to local knowledge creation and its transition into innovative products and public or private services. Creative artists, social scientists and technical and industrial scientists may be involved while addressing the challenges stated above.

It is claimed that a university may play a bigger role in innovative societies based on knowledge. Moreover, it can use the knowledge produced by itself which provides a new way of knowledge generation (Ryszko, 2016). Experience of various countries show that universities are an important driver of economic development and contribute to social and economic development. However, it is a successful cooperation of an industry with universities that must support missions and incentives of each of the partners. University and industry are two different systems with distinct goals. The goal of improvement of cooperation between university and industry should not be to reverse the roles of these entities, so that the university becomes the industry and/or vice-versa. It should be accepted that both parties in this process are driven by different motives and goals (Table 3).

Table 3.
Motivations for universities to enter into relationships with industry

Motivators	Universities	Industry
Necessity	– Responsiveness to government policy – Strategic institutional policy	– Responsiveness to government initiatives/policy – Strategic Institutional policy
Reciprocity	– Access to complementary expertise, state-of-the-art equipment and facilities – Employment opportunities for university graduates	– Access summer internship or hiring for students – Hiring faculty members
Efficiency	– Access to funding for research (Government grant for research & Industrial funding for research assistance, lab equipment, etc.) – Business opportunity, e.g. exploitation of research capabilities and results or deployment of IPR to obtain patents – Personal financial gain for academics	– Commercializing university-based technologies for financial gain – Benefiting financially from serendipitous research results – Cost savings (easier and cheaper than to obtain a license to use foreign technology) – National incentives for developing relations such as tax exemptions and grants – Enhancing the technological capacity and economic competitiveness of companies – Shortening product life cycle – Human capital development
Stability	– Shifting to the knowledge based economy (broadening the knowledge) – Discovering new knowledge/test application of theory – Obtaining better insights into curricula development – Exposing students and faculty to practical problems/applied technologies – Publication of papers	– Shifting to the knowledge based economy (broadening the knowledge) – Business growth – Access to new knowledge, cutting-edge technology, state-of-the art expertise/research facilities and complementary know-how – Multidisciplinary character of leading edge technologies – Access to research networks or pre-cursor to other collaborations – Solutions to specific problems – Subcontract R&D (for example due to lack of inhouse R&D) – Risk reduction or sharing
Legitimacy	– Societal pressure – Service to the industrial community/society – Promotion of innovation (through technology exchange) – Contribution to regional or national economy – Academics' quest for recognition or achievement of eminence	– Enhancement of corporate image
Asymmetry	– NA	– Maintaining control over proprietary technology

Source: Ankrah, AL-Tabbaa, 2015.

Different features of these two systems must be administered, coordinated or moderated in such a way which will ensure the value-addition and enhance innovative processes that are being created. What does work, are the interactive models based on the definition of collaboration in which mutual work of scientists and industry experts may ensure more favourable cooperation results than in the traditional approach where connections are determined through contract research, consultations and supply of services. In such scheme usually it is the industry that defines the problem, whilst a scientist or a group of university scientists offer their solution options. However, this approach is limited to short-term ad hoc problems only and does not include long-term, well designed technological strategy. Clear strategies, plans and decisions based on a common concept that combines various approaches based on the strengths of entities (considering also specific economic and social environment), are certainly more promising and closer related to the assumptions of collaboration than letting everything be dependent on coincidence only.

The option of collaboration is especially important in dynamic and uncertain environments in which unusual situations require coordinated actions (Blomqvist, Levy, 2006). Collaboration is crucial in the process of creation and knowledge transfer. The role of collaboration is highlighted in the markets based on technology, where we deal with uncertainty and technological or organizational complexity and, as a result, a high need for creating information and knowledge (Tyler, 2001). Collaboration is based on voluntary interaction, trust and commitment, on the contrary to cooperation which is based exclusively on external motivators such as money. Cooperation as a form of action, based solely on external motivation and economic justification is not enough when dealing with today's global, knowledge-based competition. The idea that allows and explains many successes in creating the knowledge and innovation is based on collaboration. It emphasises relational aspects, it is clearly multidimensional - trust, communication and dedication are the key factors distinguishing relational exchange (collaboration) from transactional exchange (cooperation) (Blomqvist, Levy, 2006).

In order to present the process of cooperation development and science-business relations, the concept of distinguishing the level of integration from identification and/or creation of networks of organizations (with a purpose to make a collaboration) was used. Four levels of integrity have been distinguished in this regard: networking, coordinated networking, cooperation and collaboration. The cooperation development process was described based on four distinguishing features of inter-organizational networks, i.e. network governance, value, structuralism and network competence. Details are presented in Table 4.

Table 4.
The process of maturing of cooperation between science and business.

Main criteria	Networking	Coordinated networking	Cooperation	Collaboration
Network management	Communication and information exchange. No coordination system. Identification of key network actors.	By appointing the coordinators or determining coordination principles, the access to complex University units is easier to get. They become more open through the creation of internal organizational structures. Formation of social relations (e.g., conferences, meetings, social networks).	The coordination system based on participation, engagement of each of the cooperation parties.	Working together (Creating together). Coordination system based on participation, engagement of each of the cooperating parties, joint responsibility. Effectiveness and transparency.
Value (network rent)	Within the science – business relations it is present in a minimum degree. In business, the reduction of transaction costs is noticeable and the synergy effect is obtained based on the value chain.	Goals based on complementarity. Rental aligning activities for mutual benefit. The synergy effect by way of the value workshop – built based on the university - business feedback. Transfer of university-generated IP (such as patents) to firms (e.g., via licensing).	Compatibility of goals. Individual identities. Working apart (with some coordination). Network effect perceived as multiplication of connections (simple summing of nodes potentials). Development and commercial exploitation of technologies pursued by academic inventors through a company they (partly) own (spin-off companies).	Joint goals. Joint identities. Working together (Creating together). Joint responsibility. Network effect - connecting another sets to the network, increasing the value of the whole network as well as individual sets. Inter-organizational arrangements for pursuing collaborative R&D, including research consortia and joint projects.
Structuralism	Network actors are identified, actions nodes emerge. Diffusion of knowledge transferred within hierarchical knowledge diffusion process.	Increased number of actors and frequency of relations, especially within the scope of commercialization ecosystem development. Diffusion of knowledge using the system approach instruments, empowered by e-communication tools.	Noticeable ecosystem of scientific effects of commercialization. Diffusion of knowledge using the holistic approach instruments.	Hub is created wherein organizations, employees and the society are characterized by proper closeness and frequency of relations. Diffusion of knowledge using the complexity instruments theory. Shared infrastructure: using university labs and equipment by firms, business incubators, and technology parks located within universities.

Cont. table 4.

Network competences	Identified competences of entities supporting the development of the science-business relations	Special ecosystem is created and is related to the commercialization of the research results. There are new competences merging the needs of the science and business (e.g. technology or innovation brokers). Using the codified scientific knowledge within the industry.	Competences of the ecosystem actors are clearly defined. The synergy effect is obtained through their addition. Training of industry employees, internship programs, postgraduate straining in the industry, secondments to industry of university faculty and research staff, adjunct faculty of industry participants.	Development of network competences is natural. Resources and skills are used for research works. Research-related activities commissioned to universities by industrial clients, including contract research, consulting, quality control, testing, certification, and prototype development.

Source: own elaboration based on (Czakon, 2015; Organa, Niemczyk, 2017; Klimas, 2013).

The next stages of maturity of cooperation between science and business university-industry collaboration involve:

- Networking. At the initial stage of network cooperation, we deal with the development of communication process and exchange of information oriented on mutual benefits. This is the time for identification of business environment institutions. Competences of entities supporting the development of science-business relations are identified. At this stage, the key value is to find out about the needs of the scientific and business community and to build a climate of cooperation.
- Coordination of the network. Cooperation that has been undertaken in terms of the network adopts certain organizational forms. Associations or, e.g. special purpose vehicles (SPV) are established. They serve primarily to commercialise R&D results and facilitate the university's contacts with business. A particular ecosystem of commercialisation or innovation is being created, where new competences are being developed. They combine the needs of science and business (e.g. technology or innovation brokers). A network effect is achieved through an understanding of the complementarity of activities and the implementation of - mostly - single science-business or business-science projects. However, it is assumed that each entity may have a different goal and use its own resources and methods of creating values.
- Cooperation. It includes not only information exchange and adaptation of actions, but also sharing the resources in order to achieve compatible goals. Cooperation is being achieved through division of tasks and exchange of resources. The aggregated value is the result of addition of specific „components" of values, which are generated by the business and university. A joint programme for the development of cooperation is developed, involving the implementation of joint projects on which each entity works independently, with an element of coordination of the whole process, designed by one

entity. However, the role of coordinators is strengthened, e.g. special purpose vehicles (SPV) and new ecosystem actors (like financing institutions, social and public partners) emerge. Examples of American, Israeli or German ecosystems show a large open community that creates the environment in which you work on your own projects. However, there are other people and entities around, implementing these innovations.

– Collaboration. A process in which business and university share their information, resources and responsibilities for a long-term cooperation and common projects. This step is perceived as a process of mutual creation. This means sharing the risk, resources, responsibilities and rewards. Cooperation covers mutual involvement of participants in order to solve the problem together. And that means mutual trust. The effect of the network operation is visible and the individual contribution into creating the value is much more difficult to determine. This process requires maturity of both parties – business and university - to be able to participate in such a collaboration. Moreover, it is strongly connected with cultural factor based on relations and transparency of both entities. International ecosystems create highly diverse, goal-oriented environments where cooperation between university and industry creates optimal mutual benefits and synergies. Universities, through the creation of external organisational structures, e.g. special purpose vehicles (SPV) become more open to the transfer of knowledge (which is existing at the university) and its use by business.

4. Cooperation or collaboration – Polish case studies – results and discussion

Science-business cooperation should be one of the most significant factors of innovative processes (knowing the expectations of both parties), let us take a look on what kind of cooperation in Poland we are talking about. In 2019, the first competition in the programme „Excellence Initiative - Research University" (IDUB) has been announced. „Excellence Initiative - Research University" (IDUB) is the key initiative of the 4-year long reform period of the Polish university education system implemented by the "Constitution for Science". The 20 best universities that presented an ambitious development plan with a clear strategy to achieve the best results in studies and gain a good networking within the international community have been qualified for the competition. Ten universities - that will strive to attain the statute of a research university and will effectively compete with the best academic centres in Europe and in the world - have been selected. These are:

1. University of Warsaw.
2. Gdańsk University of Technology.
3. Adam Mickiewicz University in Poznań.
4. Stanisław Staszic University of Science and Technology in Cracow.
5. Jagiellonian University.
6. Warsaw University of Technology.
7. Medical University of Gdańsk.
8. Silesian University of Technology.
9. Nicolaus Copernicus University in Toruń.
10. University of Wrocław.

The „Excellence Initiative - Research University" (IDUB) was to present strategic operations - invented by Polish universities – which would raise the level of scientific studies and the quality of education and would also contribute to the increase of the international meaning of a given entity. The priority research areas are fields where the universities will perform intensified scientific operations. Their presentation is a sort of an invitation to collaborate with the industry sector; collaboration that can be characterized by innovativeness, flexibility and openness to a changing economic conditions. If modern companies want to implement their strategic goals related to innovation absorption, they should establish multi-level relationships with other entities, including scientific ones. Willingness to take advantage of the offer proposed by the universities will bring measurable benefits to all parties by concentrating on the fields and functions which each of the entities performs best. The brief characteristics of Polish Research Universities are presented in the table 5.

Table 5.
Short characteristics of Polish Research Universities (research area)

No.	Characteristics of Polish research universities.
1	**University of Warsaw** It was established in 1816. Today, it educates 48 thousand students and offers over 100 faculties and specializations within the scope of humane, social, mathematical and environmental sciences. Archaeologists, astronomers, physicists and information technology engineers as well as specialists in other domains developed by the University of Warsaw on 21 faculties (and the remaining scientific and research centres) are very successful in their fields of study. Six Nobel Prize winners have studied at the University of Warsaw. It represents the following Priority Research Areas: • Earth science; • mathematical and information tools for big data analysis; • innovations related to new materials; • broadening the humane discipline limits; • searching for regional solutions to global challenges. UWRC Ltd. – Special Purpose Vehicle (SPV).

Cont. table 5.

2	**Gdańsk University of Technology** This Univesrity is the organizer of numerous national and international conferences, symposiums and seminars. The priority research areas are focused on the most promising directions of scientific research and implementation of innovations in Europe and around the world: health, safety, digital technologies and supporting technologies, climate protection, gaining and conversion of energy, mobility, food and rational utilization of natural resources. Since 2017, the university has been entitled to use the *HR Excellence in Research* logo. It represents the following Priority Research Areas: – Health; – Safety; – Digital technologies and supporting technologies; – Climate protection; – Gaining and conversion of energy; – Mobility; – Food; – Rational utilization of natural resources. EXCENTO Ltd. – Special Purpose Vehicle (SPV).
3	**Adam Mickiewicz University in Poznań** It is the home for almost 38 thousand students and 5 thousand employees. In 20 different discipline-oriented departments and 4 remote facilities (in Kalisz, Słubice, Gniezno and Piła) the university offers 80 faculties and 237 specializations of the 1st and 2nd degree and 50 post-graduate courses. Since the beginning of 2018, the university, together with 7 European universities, has been forming the EPICUR consortium within the scope of the European Universities network. Last year, the university scientists have implemented 595 research projects of a value equal to 279 million PLN and published almost 8 thousand papers, including: 1273 in magazines from the IRC list and 318 monographs. It represents the following Priority Research Areas: – life sciences, i.e. the field of biology, chemistry, physics; – exact sciences: mathematics, information technology; – humane and social sciences.
4	**Stanisław Staszic University of Science and Technology in Cracow** The university has been established in 1913 and opened in 1919. It educates at over 60 faculties within 16 departments. It offers education at the doctoral level and over 100 types of post-graduate studies. It employs over 2000 scientists, including 600 independent science employees. It uses 800 laboratories equipped with modern instrumentation. Reliable position of the university is confirmed by many successes in many international rankings. In the *Academic Ranking of World Universities 2019* (known as the Shanghai list) that presents 1000 best universities in the world, the University of Science and Technology in Cracow has been classified within the range 601-700, having the 1st place among Polish technical universities and the 3rd place on the general list of Polish universities. It represents the following Priority Research Areas: – Sustainable power technologies, renewable sources of energy and energy storages as well as resources management; – New technologies for the closed loop economy: combination of business models with eco-innovations; – Water-energy-climate: interdisciplinary approach to sustainable development; – Application of mathematics, information technology and electronic tools in solving the macro, micro and nano problems; – Biotechnology and bioinspirations in the engineering and materials science, biosensors, bioenergy, biocatalysis, biocomputers and biocalculations; – Smart information, telecommunication, computer and control technologies; – Designing, production, studies of modern materials and future technologies based on multidisciplinary approach; – Experimental physics of high energies, extreme states of matter, advanced technologies in detection of radiation, transdisciplinary studies and applications. Krakowskie Centrum Innowacyjnych Technologii INNOAGH Ltd. - Special Purpose Vehicle (SPV).

Cont. table 5.

5	**Jagiellonian University** The oldest university in Poland and one of the oldest in this area of Europe. It was founded by Kazimierz Wielki in 1364. Today, the university employs over 540 professors, 730 Philosophy Doctors (PhD), 2600 other people who are the teaching staff and over 3.5 thousand administration employees. It educates about 50 thousand students and doctors at 16 departments, including 3 medical departments that came back to the University in 1993 and form the so called Collegium Medicum. The university continuously improves and develops its infrastructure through the construction of: "Kampus 600-lecia Odnowienia Uniwersytetu Jagiellońskiego" (600 Anniversary of the Jagiellonian University Campus), Environmental Education Centre and Geology Institute, construction of new and modernization of the existing Paderevianum object for the Philological Faculty, complex modernization of Collegium Novum and the streets of the "University Block". It represents the following Priority Research Areas: – Heritage (cultural heritage); – FutureSoc (interdisciplinary studies on functioning of societies of the future); – BioS (structural and translational biology); – qLife (social and civilization diseases, reproductive health and regenerative medicine); – SciMat (advanced materials); – DigiWorld (digital technologies); – Anthropocene (global changes of the environment). INNOCEL Ltd. - Special Purpose Vehicle (SPV).
6	**Warsaw University of Technology** It began its independent operations in 1915. But its history is much longer - it has been educating generations of engineers since 1826 and brought its significant input into the development of technical sciences in Poland and around the world. This is a well renowned university which is built on numerous successes of its scientists, employees, students and graduates. New faculties, new laboratories, close cooperation with companies and foreign centres ensure the development perspective and the best technical education in the country. It represents the following Priority Research Areas: – photonic technologies; – artificial intelligence and robotics; – cybersecurity and data analysis; – biotechnology and biomedical engineering; – material technologies; – physics of high energy and technique of experiment; – energy conversion and storage. Instytut Badań Stosowanych Politechniki Warszawskiej Ltd. - Special Purpose Vehicle (SPV).
7	**Medical University of Gdańsk** For almost 75 years is has been providing high level of education within all medical professions. It runs scientific research at the highest, world-class level. The university educates over 6000 regular students, Ph. D. students and post-graduate students. There are 935 foreigners who represent 15 percent of all of the university's students. It is a modern academic centre recognized in the country and around the world. It represents the following Priority Research Areas: – oncology; – cardiology; – cardiovascular medicine; – biochemistry; – genetics; – molecular biology. Centrum Innowacji Medycznych Ltd. - Special Purpose Vehicle (SPV).

Cont. table 5.

8	**Silesian University of Technology** The oldest technological university in the region of Upper Silesia. It was established in 1945. The mission of the university, as a prestigious European technical university, is related to innovative scientific studies and development works, training highly qualified personnel in aid of the society and economy based on knowledge as well as active influence on the development of the region and local societies. The university, which is based on continuous improvement of processes and organizations, is a friendly and open area, designed for working and development of the academic society. Until today, the Silesian University of Technology has promoted over 200 thousand engineers. It represents the following Priority Research Areas: – computational oncology and personalized medicine; – artificial intelligence and data processing; – materials of the future; – smart cities, mobility of the future; – automation of processes and Industry 4.0; – protection of climate and environment, modern power engineering. Innowacje Politechniki Śląskiej Ltd. - Special Purpose Vehicle (SPV).
9	**Nicolaus Copernicus University in Toruń** It was established in 1945. It consists of 16 departments and the Interdisciplinary Centre for Modern Technologies. Today, 22 thousand students (more and more from abroad) study at the university that is the home for over 4 thousand employees. It offers studies within almost all disciplines of knowledge. Except the traditional study faculties, there is also medicine, arts and technical science. The medical faculties are located in Bydgoszcz. The university has its entities also far away from Poland: since 1975, there is a Polar Station on Spitsbergen Island) established by the University) and in Würzburg, Germany where the University has established the Polish Historical Mission. This university represents the following Priority Research Areas: – astrophysics and astrochemistry; – fundamental optics for biophotonic applications; – dynamics, mathematical analysis and artificial intelligence; – personalized medicine (interactions - mind, society, environment). Centrum Transferu Technologii UMK Ltd. - Special Purpose Vehicle (SPV).
10	**University of Wrocław** About 25 thousand students, Ph. D. graduates and post-graduate students gain their knowledge which is delivered by 2 thousand academic teachers and over 450 professors. The University of Wrocław is the leader among Polish universities (it is most often chosen by foreign students). Today, almost 1500 foreigners study at this University. It represents the following Priority Research Areas: – new materials; – big data; – artificial intelligence; – health - from the analysis of genes to designing medicine, human being between nature and culture; – human being - city and environment, multiculturalism. Centrum Innowacji i Transferu Wiedzy Uniwersytetu Wrocławskiego Ltd. - Special Purpose Vehicle (SPV).

Source: own elaboration based on universities websites and interviews.

The chance to participate in the competition became an incentive to consider and show the priority research areas wherein intensified scientific operations will be performed and to analyse strengths and weaknesses of the university. Priority Research Areas organised by the universities in Poland, constitute an offer and invitation towards undertaking common actions. They may become a starting point for verification of the level of cooperation or collaboration at which we currently are and towards which we should strive.

At this moment - in Poland - the science-business relation can be characterized at the level of the coordinated networking – cooperation. There appear coordinators, e.g. goal oriented companies (acting at the universities) which create commercialization or innovation ecosystems (Knop, Odlanicka-Poczobutt, 2018). The effect of commercialization in the form of spin off or sale of licenses is based on a so-called value workshop that is built based on single university – business interfaces. Proposals and needs of interested parties are identified, however the network effect is not detected yet, because the present density of the network is not permanent and the relations are based on a case analysis (not on the ecosystem impact). The network competences are based on brokers. If mutual openness for cooperation is to acquire a special dimension and intensity in Poland, the next step needed is to build a local community open to connections and cooperation in international environments. Thinking in the aspect of, not dominating such place by one company but creating a system made up of network of companies, individual consumers, consumer communities cooperating with each other and creating value, is needed (Yigitcanlar et al., 2020). In such environments, knowledge is being disseminated amongst many players, and companies are encouraged to make use of available information and ideas of others. Cambridge Innovation Center (CIC) is an excellent example for creating technological societies and environment which favours cooperation between various groups of stakeholders. Its founder, Tim Rowe, said that "this is an environment that operates as a hub. You work on your own projects in it but there are other people around who introduce innovations and it is them, who most probably will be able to open for you the doors which cannot be open in a another way". Currently, there are seven centres of innovations, so-called District Halls, that create international ecosystem allowing to support entrepreneurs and respond to changing reality even faster. It is a place where people can work, exchange knowledge and build strong relations by associating each and every potentially interested party in the local ecosystem. Diversity of such entities is the key. Starting with individual entrepreneurs and scientists, inventors as well as small teams devoted to innovations and ending up with large corporations and representatives of the public sector. Accidental contacts within the innovative society can help understanding the meaning of existence of such spaces. There are infrastructural elements that enable such interaction available on the campus. The key is the so-called District Hall. In Boston, the central hub, is the place where people from around the city can meet, exchange knowledge, build valuable relations. This is the city that teems the economic life with a very high level of competition and continuous development of new ideas and new companies. The universities are the main motive power in Boston and the CIC is the catalyst that releases and binds the university studies and entrepreneurship with money from the investment funds. These centres require strong educational infrastructure with world-class universities, delivering new ideas through basic research, technological innovation and capital. At last, flow of ideas and people from other regions is needed, while innovators should be encouraged to stay in the region when being offered a high quality of life (Majava et al., 2013) . In the District Hall, the communication problem disappears. An access to complex

university units becomes easier and the universities themselves become more open by creating internal organizational structures that have clearly defined interface and access to the outside world. It is this field, where universities will be able to play an important role, granted that they are capable of developing and offering new, suitable concepts of using expertise and skills and if they are able to realise projects for the selected industry target groups, based on identified strengths of the university. They could then organise their relations in the world more systematically. It is a complex, but highly diversified environment at the same time. It produces interactive goal-oriented processes, which are suitable for reinforcement of collaboration between the university and the industry, and creates optimal benefits and synergies. It is important not to perceive mutual interactions in a short-term perspective where the transfer of knowledge which already exists at the university can be reduced to a specific application and its use. Long-term horizon is the key. It will allow to generate processes and effective communication between entities involved in the District Hall, such as: science, economy, administration, financing institutions, social partners, public opinion.

Priority Research Areas proposed by ten universities in Poland also consist of aspects connected to the development of international cooperation. World-class universities open their campuses in the developing countries in order to engage themselves in research and development. It allows universities to use their reputation and knowledge globally, as exemplified by Georgia Institute of Technology, one of the best research universities in the USA, which established new campuses and research and development centres in France, China, Costa Rica, Ireland and Singapore. Research universities in Poland should also focus on the development of international potential through participation in international innovation systems. Creation of campuses and research and development centres will simplify close cooperation with local entities in terms of generation and dissemination of knowledge and technology. Above all, such creation will develop the value of collaboration defined by Schrage (Schrage, 1995) as „a process of common creation: two or more people with complementary interaction skills create shared understanding that was not possessed by anyone before and could not be created on one's own”.

Moreover, it should be emphasized that there are many regions in Poland in which, as a result of centuries of the history, many economic, social and environmental problems accumulated and these were related to the restructuring of the economy and often degradation of the natural environment. Thanks to the experience - gained already in the processes of economic and social transformation - and conditions, such as the network of adjacent cities, population density as well as technical infrastructure and industrial tissue, the Silesian Voivodeship may be the best example for testing and implementing solutions aimed at effective cooperation. These activities are multi-threaded and comprehensive. They can be analyzed in terms of increasing the attractiveness of cities, strengthening competitiveness, changing the image of the cities or even increasing the quality of life of residents. In order for the above tasks to be viable, it is necessary to constantly develop knowledge using the latest, advanced methods

in biology, biochemistry, hydrobiology, hydrogeology, biophysics and other natural sciences, but is also necessary to make compromises resulting from various management, social and economic decisions. Cooperation seeking collaboration should be based on proposing actions aiming at building a synergistic, regional system to support transformation processes by mobilizing and systematizing existing, dispersed human and organizational resources. This can be achieved, among others, by looking for development niches, popularizing new technologies (including within traditional industries) and their opportunities for further development, including testing processes and experimenting with different solutions and pilot activities. Moreover, the social dimension will be of key importance. Social dimension understood here as the identification of recipients of planned activities and services, analysis of needs and adaptation of tools to the expectations of those recipients. This will allow the inclusion of interested entities such as scientists, innovators, enterprises, urban activists and NGOs in project consortia focused on solving key problems and developing a collaboration-oriented model focused on transformation processes.

5. Conclusions

Fast-paced technical progress and globalization processes force entrepreneurs to invest in the access to new technologies and knowledge. If modern companies want to implement their strategic goals related to innovation absorption, they should establish multi-level relations with other entities, including scientific ones. Such collaboration allows for mutual complementation and improvement of operations related to development and introduction of new products and services to the economy. The will to use the offer proposed by the universities will bring measurable benefits to all parties by focusing on these areas and functions that are best performed by each of the entities. The university education system and business are different and thus are managed by different regulations, therefore it is necessary to remodel the approach to the contemporary universities. Nowadays, universities provide education based on the state-of-the-art scientific studies. Moreover, they put emphasis on practical application of know-how, where the collaboration at the contact point between science and business becomes one of the most important factors of innovative processes. However, entrepreneurs await transfer of knowledge performed by the people who have such knowledge.

The proposed cooperation maturity model between a university and a business is a solution based on the network integration process and description of such network discriminants as: network governance, value (network rent), structuralism, network competences. Cooperation between science and business striving for collaboration based on better understanding of commercialization processes of the research results, their innovativeness and adaptation to the needs of the economy and society. This does not preclude the individuality of the goals,

especially within the scope of research independence performed by scientists. Coordination process (network governance) is based on engagement, responsibility, effectiveness and transparency of entities. The developed cooperation principles, alike in case of the District Hall, create hub, wherein organizations, employees and the society characterized by proper closeness and density can meet, share knowledge or build valuable relations. This allows for creating special network competences that have strong positive impact on the technological cooperation scope between organizations and on the product innovative success or operations.

The authors of the study are aware of the limitations of the presented considerations. The article is of conducive nature and assumes deepening of the research in this area. The article is focused on searching for a way to collaboration within the science-business relationship. Detailed analysis of the cooperation maturation process in different countries will be the subject of next articles and studies. In case of Poland, that undergoes the process of significant changes in the area of science, this is the grounds for future operations. Moreover, comparative analyses allow for verifying the presented proposition of the cooperation maturing process in the science – business relationship.

Acknowledgements

The article presents the results of research project co-financed from a subsidy granted to the Silesian University of Technology, Faculty of Organization and Management, Department of Management, project no. 13/040/BK_23/0114.

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