

THE ROLE OF ENTREPRENEURIAL DISCOVERY PROCESS IN TECHNOLOGICAL DEVELOPMENT OF SILESIAN VOIVODESHIP

Małgorzata MARKOWSKA^{1*}, Mariusz KRUCZEK², Małgorzata DESKA³

¹ Central Mining Institute; Katowice; mmarkowska@gig.eu, ORCID: 0000-0002-9105-6856

² Central Mining Institute; Katowice; mkruczek@gig.eu, ORCID: 0000-0002-5052-3729

³ Central Mining Institute; Katowice; mdeska@gig.eu, ORCID: 0000-0001-5168-2169

* Correspondence author

Purpose: the main purpose of this paper is to define the scope in which the entrepreneurial discovery process for smart specialization affects the technological development of the region.

Design/methodology/approach: Based on theoretical analysis of the concept of smart specialization and entrepreneurial discovery process (EDP), set of research tools and methods has been proposed, including broad participation and interaction between EDP participants. The research tool – questionnaire for studying the needs of entrepreneurs in the direction of technological development of the Silesian Voivodeship consisted of four thematic blocks, including such aspects, as: innovative activity, financial aspects and the effectiveness of obtaining funds, cooperation and development strategy. A representative group of 300 companies was selected to participate in the survey. The responses obtained were processed and generalized using statistical methods – with use of MS Excel and Statistica software. The results of the research, conducted in 2017-2019, were used as a tool to identify areas of technological and cooperation advantage in the Silesian Voivodeship and recommendations for the update of Regional Technological Program for the 2030 perspective.

Findings: The role of different groups of actors is varies substantially in terms of their involvement and impact, with the stakeholders from business and research are the main group to be targeted in the entrepreneurial discovery process.

Research limitations/implications: The results provide a basis to improve the effectiveness of regional development planning, especially solutions for SME involvement and cooperation. The results confirm, that a detailed study of entrepreneurs' needs should be included as the main instrument for the implementation and for gaining reliable information on the effectiveness of implemented solutions in the field of innovation support.

Limitations of the study include the subjectivity of respondents' opinions and the relatively small research sample, which may limit the generalization of the results.

Practical implications: The results of the survey indicate the existence in Silesian region of the distance between entrepreneurs and scientists (thinkers and doers), which may result in lessening of effectiveness and willingness of cooperation, without preventive measures on a regional scale. The results also confirmed, the existence of financial barriers for innovativeness activities, especially impeded access to external capital, translating into lost benefits.

Originality/value: The contribution of the research to the development of innovation management process in the region, which is based on a broad process of collaboration with different stakeholder groups. The results provide a contribution to the operationalization of the entrepreneurial discovery process.

Keywords: entrepreneurial discovery process, smart specialization strategy, technological development.

Category of the paper: research paper.

1. Introduction

Dynamic changes in the economy caused by the ongoing transformation of the region, blurring of boundaries between industry sectors as a result of diffusion and transfer of innovations, setting new directions of development in the European and global economy and changes in the socio-economic environment enforce openness to the ongoing technological changes (PRT, 2019). Finding niches of competitive activity based on innovation and eco-innovation is the key to increasing the competitiveness of enterprises in a given region and, by extension, improving the competitiveness and development of regions. Relationships and cooperation between different stakeholder groups, especially between entrepreneurs, researchers and consumers, are one of the key features of entrepreneurship, innovation activities and technological development of the region. The need to involve a large number of diverse stakeholders to collaborate on important policy decisions is one of the key aspects of innovation policy (Martin, 2010).

According to OECD (2003), diverse stakeholder involvement in setting up the development priorities is an important trend in most countries. New approaches to decision-making processes include extensive consultation with scientists, political, business and community representatives, undertaken in the interest of increasing transparency and better responding to societal needs. At the level of the region's economic and technological policy-making, there is a particularly important need for strategic collaboration between the regional government and the private sector to overcome development obstacles and take advantage of existing opportunities. This strategic cooperation should form the basis of the entrepreneurial discovery process (Rodrik, 2004; Mieszkowski, Kardas, 2015).

The primary aim of the paper is to operationalize the concept of entrepreneurial discovery in the development of technological development for the Silesia region. A complementary objective is to obtain a set of recommendations on the role of entrepreneurs in the process of updating the region's technology development agenda, which will enable policy makers to identify and support initiatives and processes of this kind. The theoretical and practical aspects of the entrepreneurial discovery process are presented by recalling a series of definitions and characteristic elements. The Technology Development Program as one of the key policies for

supporting the implementation of the regional innovation strategy is also presented, together with a description of the process of its updating, using the entrepreneurial discovery process.

The paper presents the assumptions and results of the study of entrepreneurial needs conducted in 2017 - 2019 as a tool of identification the areas of advantage relevant for the formulation of innovation development policy in the Silesian region. The results presented in the article refer to one of the technological areas of the Silesian Voivodship, namely technologies for environmental protection. For this area, the logic and scope of entrepreneurial discovery process is presented. The analysis of the results allows translating the concept into the reality of the territory in question. The last part summarizes a number of conclusions that should be considered in the context of the possibility of further implementation of the entrepreneurial discovery process in the region, and also presents the limitations that arise in the research process.

2. Theoretical background

The concept of *entrepreneurial discovery* related to business and entrepreneurship emerged widely in the literature in the 1990s, and comes from Austrian school of economics. Israel M. Kirzner (1997) described entrepreneurship as a process of "systematic exploration of technological, political and regulatory, social and demographic changes to discover opportunities to produce new goods and services", and Ludwig von Mises stated that the person becomes an entrepreneur when he captures an opportunity and fills a perceived gap (Huerta de Soto, 2010; Janik, 2014).

Despite the modification of the basic assumptions through many years of critical discussion, the theory of *entrepreneurial alertness and discovery* has contributed to a better understanding of the phenomenon of economic development (Yu, 2001).

The definition of *entrepreneurial discovery process* (EDP) has been coined. According to Dominique Foray it's a "learning process by which a region gradually discovers which should be their priorities in R&D and innovation linked these to the ability to transform the current economic structure orientated to maintaining a path of growth and employment" (Foray, 2013; del Castillo-Hermosa et al., 2015). At the same time, Foray – one of the founders of the concept of smart specialization, draws attention to the role of the EDP for the implementation of RIS3 strategies (Foray et al., 2012), for which it's the "conceptual pillar" (Capello, 2014). This inclusive and interactive bottom-up process (Foray, 2015) is crucial to understanding the main feature that distinguishes the S3 approach from the innovation strategies of the past. The EDP reconciles the idea that policy takes matters into its own hands, shaping the regional system through priority setting, with the idea that market processes are key in creating information about the best areas for future priorities. Indeed, EDP is an ongoing process in

which participants from different backgrounds (political, business, academic, etc.) discover and produce information about potential new activities, identifying potential opportunities that arise through this interaction, while policy makers evaluate the outcomes and ways to facilitate the realization of this potential (Hausmann, Rodrik, 2003; Markkula, Kune, 2015). What's important, entrepreneurial discovery processes occur in any type of economic sector and thus can be found in any region (del Castillo-Hermosa et al., 2015).

Therefore, the benefits of the process, which include the removal of barriers to cooperation between the private and public sectors, come not only from the end results of the EDP, but also from the process itself (Figure 1).

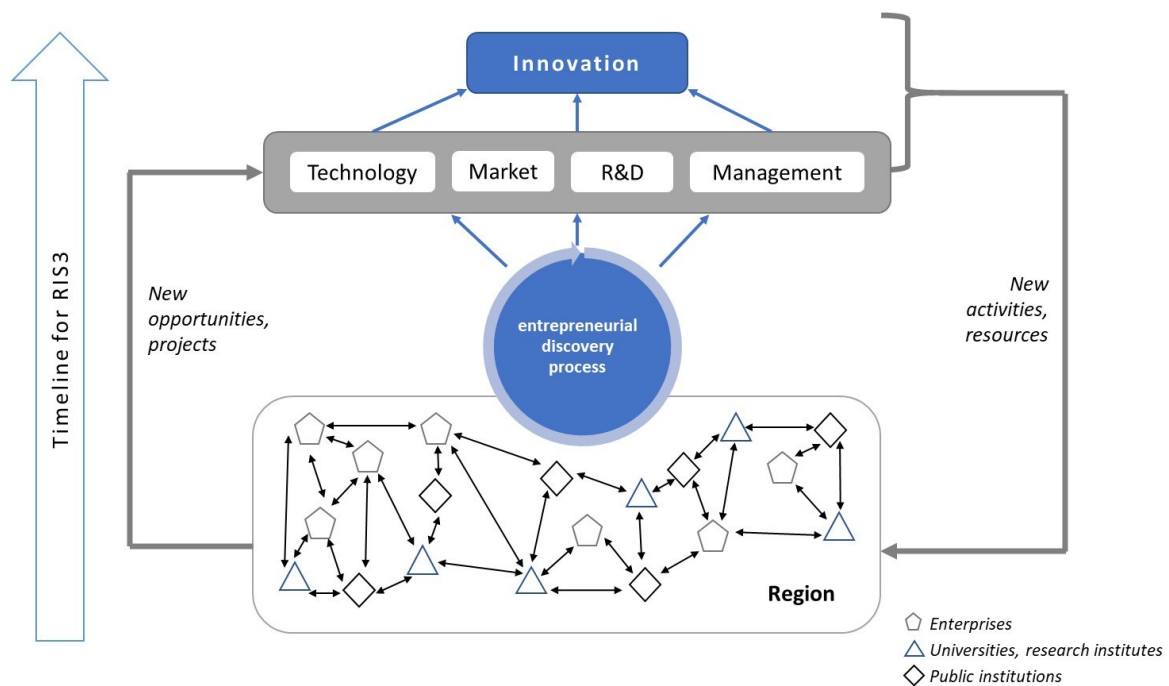


Figure 1. EDP role within region innovativeness. Source: adapted from “In Search of Domains in Smart Specialisation: Case Study of Three Nordic Regions” by A. Mäenpää and J. Teräs, J. (2018).

Therefore, the basis of the EDP must be trust and credibility (European Commission, 2018). In general, many authors highlights the vital importance of the presence of effective institutions and trust and continuous strategic cooperation between public and private actors for the effectiveness of all development processes (Amin, and Thrift, 1995; Rodríguez-Pose, and Storper, 2006; Rodríguez-Pose, 2013; Rodríguez-Pose, and Di Cataldo, 2015). It is important to note that problems related to the institutional side of the process, including excessive bureaucracy, conflicting institutional patterns, lack of stakeholder mobilization, or shortcomings in establishing a shared vision, can hinder or even prevent the entire entrepreneurial discovery process (Sotarauta, and Beer, 2017; Benner, 2019).

In this process, the public administration should, based on the identified needs of entrepreneurs, adjust the instruments of support for the implementation of innovation in such a way that it affects the growth to the development potential of companies, and consequently regions (Foray, 2013). The EDP aims to identify the most promising areas for future

development of the region by stakeholders belonging to different sectors. It is also supposed to demonstrate what the region does best in the field of research, development and innovation. This process directly translates into the creation and implementation of the Regional Innovation Strategy for smart specialization. Effective conduct of the entrepreneurial discovery process requires the integration of the evidence base represented by a set of statistical data and the knowledge of stakeholders – entrepreneurs, scientific and research units, business environment units and representatives of local government in order to effectively identify priorities for national and regional programs to support innovative development activities undertaken by individual entrepreneurs (Czaplicka-Kolarz et al., 2020). The implementation of the entrepreneurial discovery process requires the use of adequate research methods, techniques and tools to identify, monitor and evaluate growth areas with the highest development potential (Charles et al., 2012), which should receive high priority in public support (Foray, and Goenaga, 2013).

The need for extensive dialogue with members of the innovation ecosystem not only stems from the foresight methodology (Gavigan, and Scapolo, 1999; Havas et al., 2010), but also from the fact that individual actors may have relatively limited information about the world outside their immediate environment, and the information and needs they possess are often highly individualized (Schein, 2010). Using a bottom-up approach enables the support system to target real needs (activities and initiatives) leading to smart and sustainable development of the region, where the main rationale is the development of endogenous regional resources and the effective involvement of the private sector in research and innovation. The key to a successful entrepreneurial dialogue is to base the agreement on the selection of priorities on shared assumptions regarding the research and innovation ecosystem (Gheorghiu et al., 2016). At the same time, as highlighted by some authors, the exploratory nature of the entrepreneurial discovery process and the latter's priority-setting objective are potentially fraught with issues of legitimacy (Gheorghiu et al., 2016). Thus, the EDP needs to go beyond the prioritization phase and permeate policy making at different stages (s3platform, 2018), because if the entrepreneurial discovery process is not supported by strategy, policy and implementation tools and does not have a real impact on the distribution of public funds, there is a significant risk that it will remain a "paper" process (Gheorghiu et al., 2016).

The entrepreneurial discovery process has already been described quite extensively in theory, not only in the *Research and Innovation Strategy Guide for Smart Specialization* (RIS3) itself (Foray et al., 2012) and other EU documents (Foray, & Goenaga, 2013; Martinez, & Palazuelos-Martinez, 2014; Detterbeck, 2018), but also in many academic publications (Fiet, 1996; Kirzner, 1997; Charles et al., 2012; Foray, 2013; del Castillo Hermosa et al., 2015; Virkkala, and Mariussen, 2018). However – despite the rich literature on stakeholder engagement in development processes and the growing number of publications on the use of the entrepreneurial discovery process for updating smart specialization and regional development (Toward..., 2015; Mieszkowski, and Kardas, 2015; Dziedzic et al., 2016; Kruczek,

and Deska, 2018, Blažek, and Morgan, 2018), this topic still needs additional research, especially in the context of the specific experience of individual regions.

The *Technology Development Program of the Silesian Voivodeship* (known as PRT) adopted in 2011 is an operational and complementary document to the *Regional Innovation Strategy of the Silesian Voivodeship*. The first edition of the document is a strategic plan of technological development of the region which defines directions of technological development of the region in the horizon of 2020 as well as methods and tools for their evaluation and monitoring. Due to the ongoing transformation of the region, it has become necessary in recent years to review and update the existing *Technology Development Program* so that it responds to new challenges and becomes a basis for programming the region's development in the perspective of 2020+. The technological areas identified in the PRT 2010-2020 document are still represented in the Silesian Voivodeship, but structural changes caused by global trends and national and regional conditions as well as endogenous factors have made it necessary to revise their scope and to try to identify new development niches.

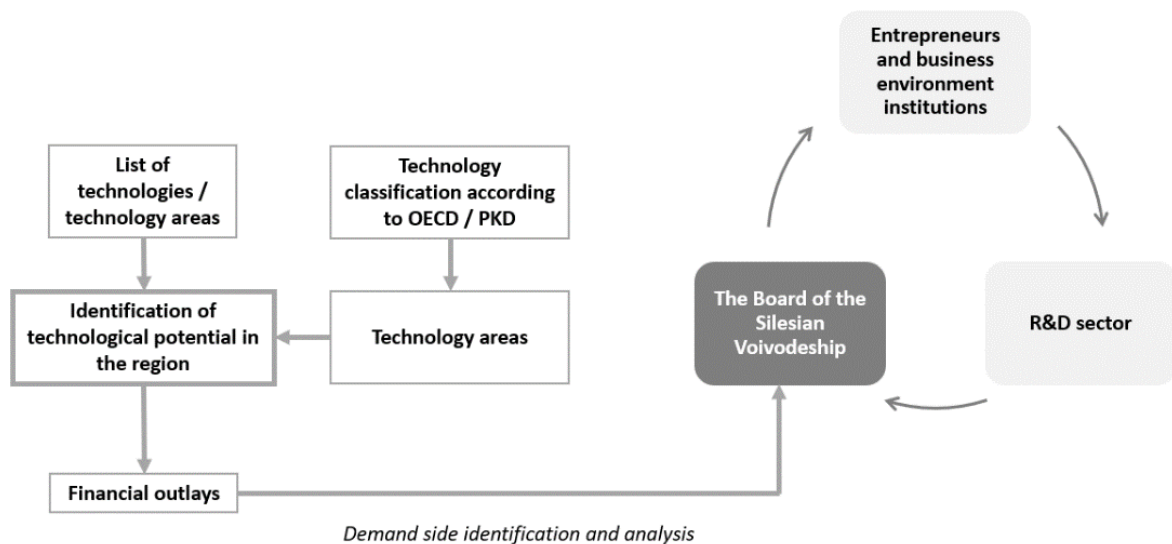


Figure 2. Aspects of assessment of region's protechnological development. Source: adapted from PRT 2011.

The entrepreneurial discovery process carried out in Silesian Voivodeship for the purposes of the PRT update was connected to the methodological approach described in the *Technology Development Program for the years 2010-2020*, which made it possible to assess and update the list of priority technologies and technology groups as well as to indicate new technological areas.

3. Methods

The PRT update has been on based entrepreneurial discovery process, with involvement of the *Network of Regional Specialized Observatories*¹, the Marshal's Office of the Silesian Voivodeship and the leading R&D institutions and business companies, with the use of extensive dialogue activities with stakeholders and actors of the innovation ecosystem from the business sector (Figure 3).

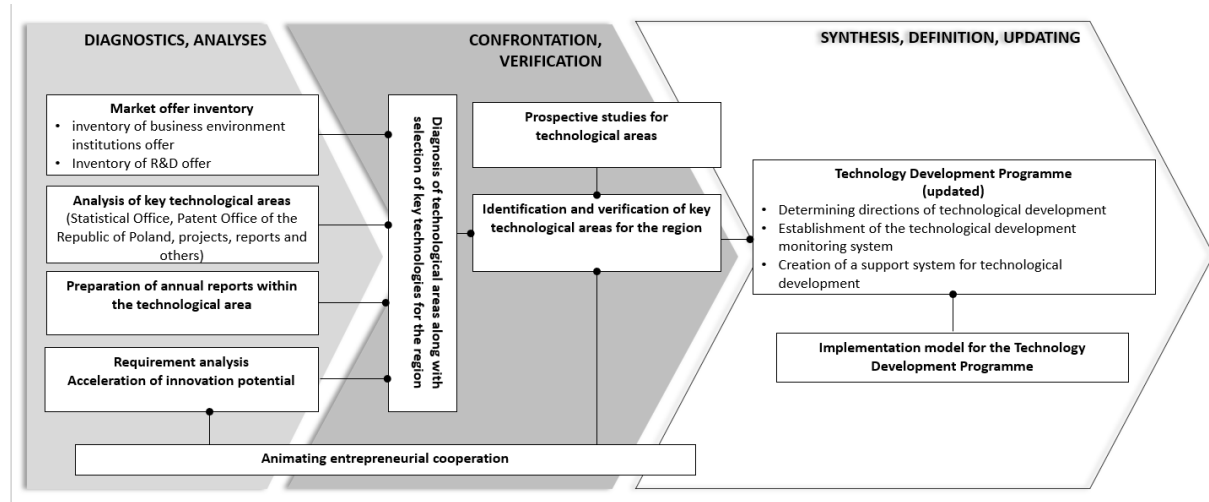


Figure 3. Model of EDP use in the update of Technology Development Program. Source: adapted from PRT 2019.

As a result, *the Technology Development Program of the Silesian Voivodeship for 2019-2030* was developed, with the main objective of identifying the region's potential to strengthen its technological advantage.

The PRT update was carried out in two parallel paths. One of them involved analytical work and research conducted by existing Specialized Observatories in selected technological areas and concerned trends in technology development and the assessment of regional potential and possible gaps. In the same time, experts carried out similar work for technological areas where Specialized Observatories had not yet been established i.e. the technology area of transport and transport infrastructure, and the machinery, automotive and mining industries. Activities involved a broad group of institutions and stakeholders. The Network implemented a number of activities aimed at intensifying the dialogue with stakeholders (i.e., research on the needs of

¹ The Network of Regional Specialized Observatories responds to the specific needs of the stakeholders in the innovation ecosystem of the Silesian Voivodeship in terms of creating a modern mechanism for monitoring the effects of innovative development of the region in particular technological areas. The network brings together research, business and business environment institutions that cooperate to support and improve the management of regional development in the field of regional scientific and technological potential, positioning of key technological areas and evaluation of the effectiveness of activities aimed at creating a regional policy of technological development of the Silesian Voivodeship and strengthening regional specialization, strengthening the adaptive potential of the region, regional market of research services and regional human resources and co-creating a regional network of knowledge and competence exchange.

entrepreneurs and research units) and making an inventory of the market offer of BEIs and the R&D sphere in the region.

One of the technological areas indicated in the PRT are technologies for environmental protection. An entrepreneurs' needs survey was conducted targeting entrepreneurs in this area. In order to create a database of enterprises, the content of web pages, search engines of national economy entities and data obtained from the Marshal's Office of the Silesian Voivodeship and the Statistics Poland, databases of business support institutions, distinctions and awards in contests for innovative companies were analyzed. Purposeful sampling was implemented – with following criteria for selecting companies for the survey were: place of business (Silesian Voivodeship), conducting business in the technological area of environmental technologies and conducting R&D or innovative activities. A representative group of 300 entities from the Silesian Voivodeship was selected and invited to participate in an interview by e-mail. Approximately 11% of companies expressed their willingness to participate in a face-to-face interview – 33 completed interviews were achieved.

The research tool was in the form of a questionnaire developed on the basis of the experience of the World Bank (Toward..., 2015), in accordance with international good practices of research on entrepreneurship and innovation and after an in-depth study of industry literature, adapted to the realities of the region. Questionnaire for studying the needs of entrepreneurs in the direction of technological development of the Silesian Voivodeship consisted of four thematic blocks and introductory part. Each interview began with an outline of the essence and objectives of the process of entrepreneurial discovery in the context of the innovative development of the Silesian Voivodeship by 2030, also the sectors of advantage in the Silesian Voivodeship selected on the basis of quantitative data analysis were indicated. Apart from the questions included in the questionnaire, the expert team asked auxiliary questions which made it possible to specify the information obtained with particular reference to the represented technological area. The respondent's statements were systematically entered into the questionnaire in the appropriate boxes. The duration of the interview was approximately 1-1.5 hours.

The research was preceded by a pilot study, the purpose of which was to verify the correctness of the assumed research procedure and appropriate refinement of the questionnaire content. As a result of the pilot study, changes/additions were made in the scope and type of questions asked in the interview questionnaire according to the conclusions and experiences from the pilot study. This was important to ensure the optimal form of the questionnaire so that it was maximally adjusted to the specifics of the Silesia region and provided as much relevant feedback as possible while being understandable and respondent-friendly.

The responses obtained were processed and generalized using statistical methods – with use of MS Excel and Statistica software. Analyses of descriptive statistics were used and graphical presentations of the collected data were made. The answers to open questions of a qualitative nature made it possible to complement in a synthetic way the results of quantitative studies in

identifying factors conducive to the development of innovation, barriers to its development, and directions of expected public support in this area in the Silesian Voivodeship.

4. Results and discussion

A key element of the study was the issues of innovative activity and innovation management. There is a variety of ways in which innovation has been addressed in the literature (Schumpeter, 1971; Drucker, 1992; Kotler, 1994; Gopalakrishnan, and Damanpour, 1997). Therefore, for the needs of this paper, innovative activity is understood as a set of scientific, technical, organizational, financial and commercial activities, including investments in new knowledge, aiming at the implementation of innovations – new or improved products/processes or their combinations that differs significantly from the unit's previous products or processes (Oslo Manual, 2018). According to the results obtained, R&D activity is an important element of Silesian companies' activity, however, more than 60% of the surveyed companies do not have a formalized R&D department. At the same time, respondents have often indicated that it often functions as a non-formalized working group established when an innovation initiative is launched. In such situations an interdisciplinary team (several to a dozen or so employees) is set up on purpose to perform specific tasks. In the remaining surveyed companies (41%) a formalized R&D department functions. As respondents indicated – mostly these departments have been established relatively recently – in last few years and with few employees.

Innovation activity is a complex process consisting of many elements. The most common element of the innovation process in the surveyed companies is the identification of market needs (over 95%), as well as the identification of innovative ideas (about 90%).

When asked about the most important sources of information on innovation, most often (nearly 90% of respondents) indicated internal resources of the company with particular emphasis on intellectual capital, which consists of specific knowledge, experience in technology/solution creation, professional skills. This is in line with the concept of a knowledge-based economy, which states that the capital of people and the knowledge they bring is the dominant element of a company's resources. Among the surveyed enterprises, 39% (mainly medium-sized enterprises) indicated the functioning of a knowledge management system, which is in line with many literature sources (Perechuda, 1998; Kubik, 2011; Pichlak, 2012; Stroińska, 2016)

An important source of innovation can be the employees' ideas (Stroińska, 2016). In this context, the functioning of a system for evaluating innovative ideas seems to be important. However, 66% of the surveyed enterprises do not use procedures for evaluating innovative ideas. The existence of a system for evaluating innovative ideas of employees and a system of incentives for innovative activities significantly affects the effectiveness of the

innovation implementation process, as shown among other Slovenian regional studies on example of eco-innovations (Hojnik, and Ruzzier, 2016).

Entrepreneurs implementing innovations have to overcome many barriers related to it. Market and financial barriers were indicated as the most significant (50%), which is conditioned by capital intensity of innovative investments at a very high risk level and complicated and unclear legal regulations. About 35% of respondents pointed out that institutional and legal barriers resulting from state policy are equally important. During face-to-face interviews entrepreneurs repeatedly pointed out to threats that occur in innovation processes, identifying them with risk. The risk related to innovations is an underestimated issue in the literature. This is caused by the specificity of innovations, which are most often treated as obvious phenomena or processes occurring in the enterprise (Piśniak, 2017). In the conducted survey, respondents emphasized primarily technological risks (47%), related to competition and customers (44%), intellectual property protection (31%). At the opposite pole, risks related to distributor acceptance (9%) and project organization and management (16%) were indicated (Figure 4). This indicates a high level of entrepreneurs' awareness of the impact of external factors related to technological trends and competitors' activities on the management of innovation processes in the company (Deptuła and Knosala, 2017; Etges et al., 2019). It also indicates developed processes in supply chain management and project execution, which is mainly due to the greater influence that the enterprise may have on these elements.



Figure 4. Sources of risk in innovation processes. Own elaboration based on the results of the conducted survey of entrepreneurs' needs. Due to the possibility of multiple choice, the number of answers does not sum up to 100%.

Another element of the survey were the financial aspects and the effectiveness of obtaining funds by enterprises in the context of their innovative activities. From the perspective of the financial aspects, the research covered enterprises whose revenue in the last reporting period in the majority (77%) exceeded 5 million PLN, and only 7% concerned enterprises with revenue below 250 thousand PLN. Additionally, more than half of the respondents (64%) declared that

total revenue also included revenue from innovative activities, including both implementation of new products and services.

Due to the high risk of realization and implementation of innovative activities and the fact that their implementation is directly related to high capital expenditures, and the return on investment and potential profits often occur after many years (Kokot-Stepień, 2016), companies, in order to reduce the risk, often decide to acquire external sources for financing such initiatives. Innovative activities can be financed both by market instruments including credits, loans, bonds, stock exchange instruments as well as public sources, which include primarily operational programs, allowing for co-financing of projects in the cohesion policy (Zembura, 2016).

As the most attractive external sources of financing for innovative activities, respondents indicated EU subsidies (31%) and EU projects (26%), while bank loans are used significantly less often for this purpose (14%). Also noteworthy is the emphasis on the attractiveness of financing innovative investments with own capital (28%). It is particularly important in the case of activities focused on implementation and commercialization, when entrepreneurs want to quickly enter the market with a new product or service. Such activities are often undertaken when the level of maturity of the innovative solution is sufficiently advanced to be able to carry out the investment without undertaking lengthy procedures of attempting to finance the undertaking from national or EU programmes and dedicated competitions.

At the same time, despite declaring a high level of attractiveness of external sources of investment financing, as many as 50% of respondents have not used public support within the period of three years. This is partly due to the fact that entrepreneurs perceive the process of obtaining co-financing as complicated and time-consuming (41% of respondents did not participate in any competitions in the last 3 years prior to the survey, while 47% of companies applied for external support less than 3 times - not always successfully). According to the respondents, access to external sources of financing is definitely difficult (31%) or rather difficult (28%). Thus, the research has confirmed that one of the barriers to innovative activity is an impeded access to external capital (Ratajczak, and Mądra, 2008). Despite being dedicated to the development of enterprises in carrying out research and innovation activities, it often causes entrepreneurs many administrative and formal problems, often translating into lost benefits.

An extremely important aspect investigated was the approach and experience of companies in terms of cooperation for innovation. The issue of approach to technological cooperation is important for understanding both practical issues in the strategic management of the company itself (Hagedoorn, 1993) and theoretical knowledge about the interaction of actors in the innovation ecosystem in the region (Radicic et al., 2018). Cooperation between entrepreneurs and between entrepreneurs and R&D units is the basis for the development of the economy of many countries and regions. The benefits of cooperation between universities and scientists and business entities are multiple, both on one side and on the other. The literature diagnoses many

advantages of cooperation of different entities for their further, especially innovative development. Among the benefits identified are reduction of costs by exploiting economies of scale and scope (Hagedoorn, 1993; Teirlinck, Spithoven, 2012); sharing of risks and uncertainties associated with innovation (Hagedoorn, 1993; Rese, Baier, 2011); and, particularly important when a firm collaborates with an R&D unit, access to the latest knowledge and technology (Zontek, 2015); the ability to choose buying over manufacturing when transaction costs are low (Williamson, 1985), which accelerates the process of implementing modern innovative solutions and bringing them to market to earn a return on innovation and overcome permissibility problems (Leiponen, Byma, 2009; Rese and Baier 2011), resulting in increased firm competitiveness (Zontek, 2015). At the same time, W.H. Hoffmann and R. Schlosser (2001) state that SMEs underestimate to a large extent some of the factors determining the success of cooperation, such as partnership management and professional management, and often lack the managerial skills and experience necessary to develop and maintain successful cooperative ties. Therefore, improving cooperation between universities and entrepreneurs has become a key policy priority for the European Commission within the idea of the Knowledge Economy: "dialogue and cooperation between business and universities should remain a priority, as should dialogue and cooperation with all sectors of society, so that all partners can benefit from the cultural, scientific and technological knowledge acquired and disseminated in universities" (University Business dialogue..., 2010).

As such cooperation is still less popular in Poland than in Western European regional countries (Zontek, 2015), the analysis of the cooperation approach of Silesian Voivodeship entities is an important element for regional development planning.

The results of the survey showed a very diversified approach of entrepreneurs to cooperation issues. A vast majority of respondents have experience in co-operation, often repeated, with R&D units. At the same time, more than 9% of respondents from the enterprise sector have not cooperated with any R&D unit before, and more than 1/3 of this group does not plan to establish such cooperation in the future. The obtained answers indicate a significant predominance of research institutes (indicated by over 89% of respondents) and public universities (over 79% of respondents) as R&D units, with which the entrepreneurs co-operate most frequently. Respondents also relatively often collaborate with technology parks (nearly 29%), industrial research institutes (25%) and other companies conducting R&D (over 21%).

In addition to the existence of the fact of collaboration, its areas, scope and effectiveness are extremely important (Figure 5).

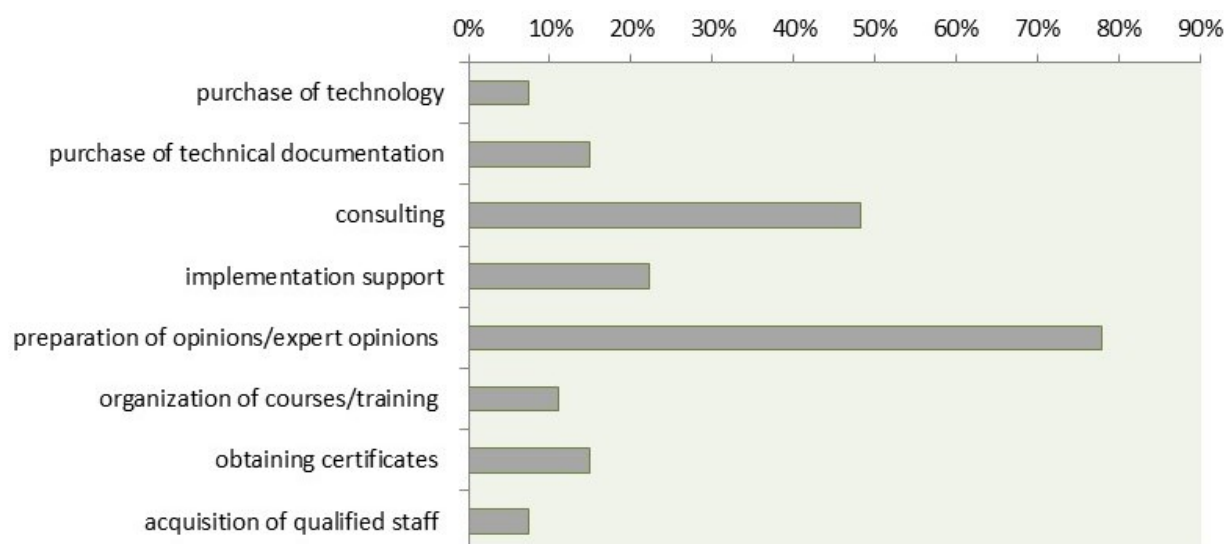


Figure 5. The most frequent areas and scope of cooperation between enterprises and R&D units. Own elaboration based on the results of the conducted survey of entrepreneurs' needs. Due to the possibility of multiple choice, the number of answers does not sum up to 100%.

The most common area of cooperation, indicated by 78% of respondents, is the implementation of research services by R&D units on behalf of companies in the form of expert opinions, analyses and opinions on specific topics. It is worth noting that this form of cooperation based on commissioning expert opinions is most often a short-term form of cooperation, which on one hand allows the companies to cooperate with different units in different subject areas, but on the other hand it is not necessarily related to long-term, permanent forms of cooperation. A popular scope of cooperation is also consulting conducted by R&D units for entrepreneurs. The respondents have indicated both holistic and long-term strategic consulting for building innovative development strategy, as well as short-term consulting for solving current problems or implementing tasks. These conclusions are very important from the point of view of the region's development, because cooperation of the scientific environment and entrepreneurs, whose main objective should be the transfer of innovations, is a key issue for the development of enterprises, consequently for the technological development of the whole region (Wach, 2005).

Awareness of existing or potential difficulties and barriers is extremely important for the development of co-operation between the enterprise sector. Administrative and legal barriers, including particularly difficult and time-consuming procedures (48% of respondents), are the most frequently indicated by entrepreneurs of the Silesian Voivodeship as barriers for undertaking and then conducting effective cooperation with R&D units (Figure 6). The opinion of Silesian entrepreneurs in this respect coincides with the assessments of experts, who indicate excessive bureaucracy in universities and a protracted decision-making process as a significant limitation in Polish conditions, discouraging companies from cooperation with universities and other units of the science sector (Szot, 2019).

Financial barriers were also indicated as significant by 29% of the respondents, although it is worth noting here that the significance of this barrier depends not only directly on the size and financial condition of the enterprise, but also on the level of knowledge regarding possibilities to obtain external funds for cooperative activities for innovative development and the type of implemented innovation.

It is worth noting that both inadequate or outdated knowledge of representatives of R&D units on real problems faced by entrepreneurs (19%) and low level of advancement of technologies that could be offered to entrepreneurs (10%) were indicated as significant barriers, which often translates – according to entrepreneurs (29%) – into the lack of an adequate offer from scientific units (see Figure 6).

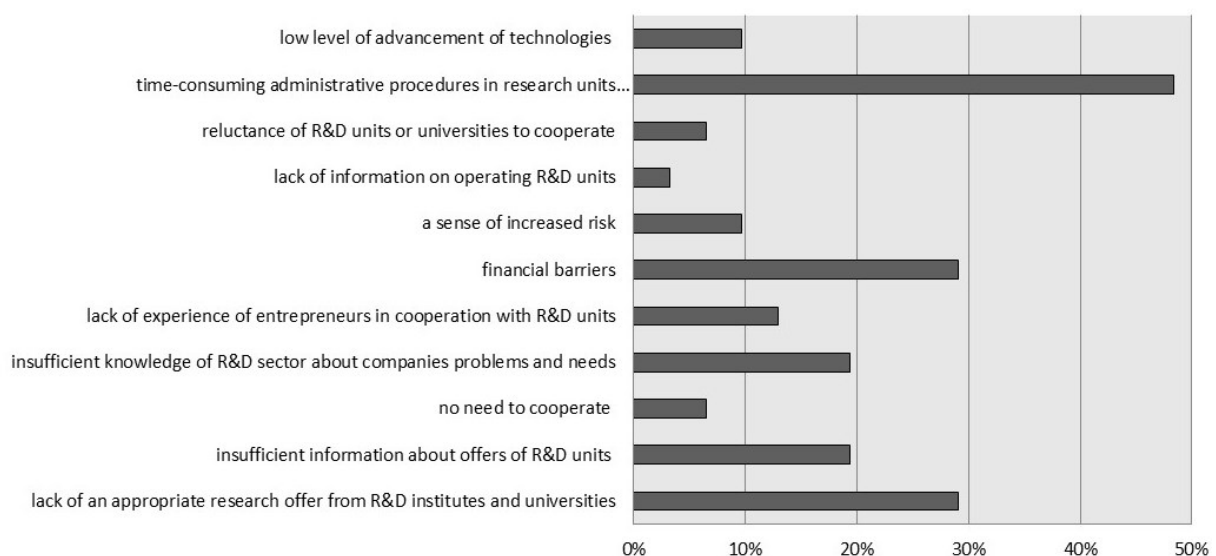


Figure 6. Factors that constitute a barrier to cooperation with R&D units. Own elaboration based on the results of the conducted survey of entrepreneurs' needs. Due to the possibility of multiple choice, the number of answers does not sum up to 100%.

These results confirm the existence also in the Silesian region of problems and distance between entrepreneurs and scientists - similar as in other regions. As a main issues may be indicated: the lack of a "common language" (Whitley, 1988), poor channels of information, and thus the diversity of what is "read" by theorists and practitioners (Van Aken, 2004; Santini et al., 2016). Among the indicated reasons for the reluctance to cooperate or the lack of effectiveness in cooperation attempts on the part of entrepreneurs, we can also note the lack of experience of entrepreneurs (13%), a sense of high risk (10%), or lack of awareness of the benefits for the development of the company resulting from conducting activities in cooperation with R&D units (6%).

Most of the surveyed entrepreneurs have experience in undertaking cooperation in order to create innovations with various partners, including those located in different parts of the value chain. Most often joint activities are undertaken with customers (clients) – as indicated by 68% of respondents – and suppliers – 64%. Much less frequently entrepreneurs decide to cooperate

with competitive entities. At the same time it is worth noticing, that more than 30% of the respondents have never taken actions for the creation, or implementation of innovative activities in cooperation with other entities, be it suppliers or customers.

The survey shows that only slightly more than 57% of the respondents have experience in technological cooperation on an international level. At the same time, a significant differentiation in the scope of experience can be noticed: from experience limited only to consultation with foreign companies on single production processes or products, conducting preliminary activities for future cooperation, or single export activities to foreign markets, through the implementation of joint projects co-financed from EU funds, to long-term cooperation on a semi-technical scale with laboratories located in different countries, joint projects on innovative products with companies from Europe and from the world, or long-term cooperation with foreign R&D units.

To sum up, interviews with entrepreneurs are an integral part of the EDP, creating an opportunity for direct contact with the actors of the innovation ecosystem – entrepreneurs and research units, allowing access to information that is often not available in other ways. A face-to-face interview conducted by an experienced expert with company representatives provides invaluable quantitative and qualitative information - information that is crucial for an effective EDP. The use of audits in monitoring protechnology development is an important part of building evidence-based policy. The effective use of the tool for research and evaluation of innovation and technology potential – i.e. direct interviews/audits – by Specialized Observatories has made it possible to obtain expert support targeted primarily at enterprises and the R&D sphere. The result of these activities is an opportunity, indispensable in the case of business, to search for directions of development, to establish cooperation with scientific and research units and to develop competencies. In turn, in the case of the R&D sector, it facilitates the acceleration of responses to the changing market conditions and better adjustment of the research offer to the actual demand from industry.

5. Summary

A detailed study of entrepreneurs' needs is the main instrument for the implementation of the process of entrepreneurial discovery and for gaining reliable information on the effectiveness of implemented solutions in the field of innovation support.

The use of an entrepreneurial needs survey as one of the elements of the conducted entrepreneurial discovery process was necessary due to the noticeable differences in knowledge, understanding and approach to the development of the regions between administrative authorities/policy makers and actors of the innovation ecosystem, as well as between the scientific community and entrepreneurs (Cavicchi et al., 2014, Santini et al., 2016).

Different authors highlight different reasons for the distance between theory and practice (often referred to as differences between "thinkers" and "doers"), such as, among others, the lack of communication between researchers and practitioners (Thomas, 2007; Van Aken, 2004; Whitley, 1988), which can translate into a lack of understanding of the real needs of doers/entrepreneurs (Santini et al., 2016).

Without preventive measures on a regional scale, including in particular the increase of activities aimed at creating a forum for continuous exchange of opinions and experiences between representatives of both sectors, it may translate into a decrease in effective cooperation in the future. Only up-to-date information from companies will allow the representatives of the R&D sector to respond more dynamically to the changing market conditions and better adjust the research offer to the actual demand from the industry. And it is the expansion of the scope of scientific research conducted in order to adapt it to the capabilities and implementation needs of enterprises, related to the development of research skills of academic staff, that broadens the scale and increases the standards of research conducted by scientists (Nellickappilly, and Maya, 2009).

Therefore, the development of the needs survey process and its dissemination supported by the improvement of competence of the *observatories'* staff and the promotion would allow to obtain information at regular intervals. This information is very important in the decision-making process for the cyclic assessment and evaluation of PRT and RIS. The needs analysis service would also enable development of dedicated support services, increasing commercial effectiveness of cooperation between units.

The main objective of the entrepreneurial discovery process is to identify priorities for national and regional innovation support programs. However, the process itself is also valuable as it helps to convince the public and private sectors towards a single vision of development focused on selected smart specializations and related business and technological opportunities. In this way entrepreneurial discovery process helps to direct limited resources and achieve a critical mass of investment. The entrepreneurial discovery process also contributes to establishing and strengthening contacts and generating knowledge and added value that would probably not have been obtained without such close cooperation between private and public sectors. The process of entrepreneurial discovery in the Silesian Voivodeship means the broad promotion of entrepreneurship. This study presents an approach to the implementation of the entrepreneurial discovery process in the Silesian Voivodeship. It presents a fragment of a broad research related to the field of environmental technologies. A similar process is being realized in other technological areas of the region, and the conclusions are reflected in the decisions made at the regional level in the scope of supporting key areas for the voivodeship – smart specializations. While successful enterprises will constitute a new specialization of the region, the role of policy is to create a flexible strategy focusing on measurable milestones, identifying obstacles and market failures and providing feedback for updating *the Technology Development Program* and *the Regional Innovation Strategy*.

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