

TECHNOLOGY OBSERVATORIES IN THE ENTREPRENEURIAL DISCOVERY PROCESS IN SILESIA REGION: THE CASE OF MATERIAL PRODUCTION AND PROCESSING TECHNOLOGY

Jan BRZÓSKA, Sławomir OLKO

Silesian University of Technology, Poland, EU

jan.brzoska@polsl.pl, slawomir.olko@polsl.pl

Abstract

The main purpose of the paper is presentation the functionalities of regional technology observatory using the example of material production and processing technology observatory operating in śląskie region. The role of technology observatory is presented and discussed as the element of strategic management on the regional level. On the base of literature analysis the theoretical background of regional technology observatories was analyzed. On the other hand some examples of existing technology observatories operating in Europe were analyzed to find the practical tasks for these kind of projects. In the end the example of regional observatory in the technological area of material production and processing was presented and discussed in the light of presented premises.

Keywords: Technology observatory, regional development, material production, material processing, technology assessment

1. INTRODUCTION

Technology is one of the pillars of contemporary economic development as Schumpeter emphasized [1], more and more globally accessible [2], but for the local and regional purposes, authorities in partnership with regional companies and scientific institutions develop regional programs of technology development [3]. The technology policy in Europe was subject of intensive changes at the regional level - from regional system approach [4,5]. The regional technological policy can be treated as technology assessment - the authorities decide which technologies to support, from the perspective of regional development. This topic was widely discussed among theorist of technology-based development mainly on the national level [6], and presently stressing the politicization of the process of technology assessment [7]. Assessing the value of technology remains a constant challenge because of the different perspectives and evaluation criteria, like: availability of resources, stability and longevity of established solutions, engineering of customers' needs [8], local and regional links with global value chain [9], technological needs of small and medium size enterprises (SMEs). These factors affect the complexity of the assessment of technology and results in large number of practical approaches to technology assessment. Haleem et al. carried out the review of the most important approaches to technology assessment (TA) and technology forecasting (TF) [10]. The essence of TA is prediction of social impact of implemented technology using various analytical methods. It can be realized by predicting of the consequences of technology, the communicating of risk, promoting innovation, improving the legitimacy of decisions on technology through increased participation, mediating in technological conflicts, and observing sustainability [11].

Proposed approach to face the challenge of delivering knowledge about technology for the regional level entitles: authorities, business and scientific entitles was establishing in śląskie a regional technology observatory. The very first idea was to set up one observatory for different technology areas available in regional industries, involving different institutions. Then, the concept of network of technology observatories consistent with the technology areas indicated in regional Program of Technology Development (pol. Program Rozwoju Technologii - PRT). In the paper the observatory in the area of production and processing of materials.

2. THE CONCEPT OF TECHNOLOGY OBSERVATORY

Technology observatories are not very frequent in science or economy. In science the term observatory is more related with observation of natural phenomena (interesting for astronomy, climatology/meteorology, geophysical sciences, oceanography and volcanology). In business practice of technology observatories the state of technology is subject of observation, the layer of practical knowledge linking the state of scientific knowledge (body of knowledge) with the layer of practical needs [12]. The main goal of technological observatory is to provide the knowledge for rationalizing regional policy on the current state of the technological area (production and processing of materials) using the information from industry and science. The concept of the observatories was based on the technological observatories established in the area of Key Enabling Technologies (KET), according to definition "Observatory aims to provide EU, national and regional policymakers with information on the deployment of KETs both within the EU-28 and in comparison to other world regions (East Asia and North America)" [13]. As we can learn from this approach the objectives of such observatory are related to TA concepts and methods mentioned earlier in the paper.

We can observe more examples of technology observatories on the national level or international level, then regional level (ex. European IT Observatory, African Observatory of Science, Technology and Innovation (AOSTI), UNESCO's Global Observatory on Science, Technology and Innovation Policy Instruments - GOSPIN [15]).

The concept of regional technology observatory was inspired by entrepreneurial discovery process realized in Śląskie region. Under this approach governments and regional authorities are supposed to assume an active role in discovering and then betting on economic niches that "are new, aim at experimenting and discovering technological and market opportunities and have the potential to provide learning spillovers to others in the economy" [14]. For the purposes of an entrepreneurial discovery process design Foray proposes the following understanding of smart specialization:

- as a process aimed, primarily, at constructing shared visions concerning future economic opportunities building on research, development, and innovation;
- with the exploratory and the prioritization components occurring mostly at the level of small innovation ecosystems;
- with the state playing several roles, among which those of a co-discoverer, a facilitator, and a priority-setter [14].

3. TECHNOLOGY OBSERVATORIES IN ŚLĄSKIE - ROLE AND ACTIVITIES

3.1. Methodology

The methodology of establishing technology observatories in Śląskie can be perceived as "design research" [15], because all of the methods have been subordinated creation of the final product: the Network of Technology Observatories in Śląskie. Design is a holistic endeavor that involves the synthesis of numerous different concerns and methods [16]. The reason for opting such methodology consider large number of internal and external stakeholders of the strategy and large extent the unpredictability of environment. Considering the number of conditionalities (formal, political, social, technological and other) the design approach in the establishing the concept of regional observatories is probably the only one to ensure the complexity of the observatories model of activity. The authors of the article have the opportunity to participate in the development of the regional observatory as members of a team of experts. The intent of the team of experts (representing various domains and sectors of knowledge), preparing the research model of the project and implementation of regional innovation strategy, was prognostic approach to creating and supporting innovative economy at the regional level.

3.2. Findings - the model of technology observatories and its activities

In developing smart specializations in Śląskie, regional authorities have attached high importance to monitoring trends in the selected priority domains of Energy, Medicine and ICTs. Thanks to the project Network of Regional Specialization Observatories, supported by the Marshal Office of the Śląskie Voivodeship, region is able to monitor, measure, support and anticipate market trends in the three priority domains as well as eight enabling technologies of the related Technology Development Plan. During the preparation of the 2014-2020 programming period, following the process of identifying the most promising areas on which the region can build its competitive advantages, we became aware of our limited capacity to monitor and analyze these areas of specialization. The Network of Regional Specialization Observatories includes partners from the domains of smart specializations who are responsible for diagnosing and reporting regional trends. As for now there are six Observatories operating for energy, medicine, ICT, environmental protection, nanotechnology and material production and processing. The regional leaders continue in efforts to establish observatories for other areas of machinery (engineering) and transport.

Table 1 Characteristics of smart specialization priorities in Śląskie and related technology observatories

No	Priority Name	Description	Related observatories
1	Energy	Advanced materials for energy distribution, advanced manufacturing systems for energy distribution, power generation and renewable sources of energy.	<ul style="list-style-type: none"> • Observatory in the area of energy
2	Medicine	Ageing societies (residential care activities); Public health and well-being (basic pharmaceutical products & pharmaceutical preparations, biotechnology and human health activities, e.g. medical services; Public health & security (services - scientific research & development)	<ul style="list-style-type: none"> • Observatory in the area of medicine
3	ICT	Cleaner environment & efficient energy networks (cleaner environment and efficient energy networks (e.g. smart grids), power generation/renewable sources); industrial biotechnology (Industrial biotechnology (Biotechnology)); advanced manufacturing systems (Advanced manufacturing systems (biotechnology and information service activities));public health & well-being (Human health activities, medical services and other professional, scientific & technical activities); micro/ Nano-electronics (Micro/ Nano-electronics (Computer programming, consultancy & related activities))	<ul style="list-style-type: none"> • Observatory in the area of ICT
4	Emerging Industries	eco-industries, maritime industries, creative industries, mobility, mobile services, personalised medicine.	no related observatory devoted to this specialization
5	Green economy	Resource management; renewable energy sources; energy and material efficiency; clean technologies of production; protection of biodiversity; corporate social responsibility; sustainable consumption and production patterns.	<ul style="list-style-type: none"> • Observatory in the area of environmental protection • Observatory in the area of energy

Very useful feature of the feature of our new smart specializations monitoring framework in Śląskie is the use of 'Smart Indexes' - the aggregated measures of regional technology development. The indexes are based

firstly on three sub-indexes for the domains of regional specialization, and secondly on horizontal indicators including the Knowledge Index, Human Capital Index or Innovation Index. The observatories identify the reliable sources of data. By monitoring the processes, while taking into account specific regional context, the policy makers will be able to observe trends and draw solid conclusions and recommendations for the region. In practice it should fulfil the concept of technology observatories: to deliver the knowledge for regional strategic decisions described in regional strategic documents of Śląskie region.

In the **Table 1** the characteristics of smart specialization in Śląskie are presented with the corresponding observatories. The first 3 specializations (medicine, energy and ICT) were indicated in Regional Innovation Strategy in 2012 [17], the next two (emerging industries, green economy) were adopted in 2018 [18].

The Network of Technology Observatories operating in Śląskie region has updated a Technology Development Programme (PRT) [19, 20] - regional strategic document indicating the directions of technology development. The document constitutes a strategic plan for the technological development of the region with the overall objective of identifying the endogenous potential of the region, taking into account the future programming period of the Regional Innovation Strategy. The programme aims at overcoming barriers to and intensifying cooperation between enterprises, research and development bodies and regional authorities. PRT identifies effective policy support tools for the development of the knowledge-based region, inter alia through cyclical (not less than once a year) evaluation of the region's potential in the technological areas. The first version of PRT established in 2012 was updated in the end of 2018. The updating process was embedded in Entrepreneurial Discovery Process and consisted of three phases: (1) diagnosis and analysis, (2) confrontation and verification and (3) synthesis, definition and updating (**Figure 1**). As a result of the last phase and one of the main product of the project the Technology Development Programme (an update) was planned. The first version of the document was elaborated in December 2018, final version - in the first quarter of 2019. All of the six active observatories realized the same research process while the technology areas were different.

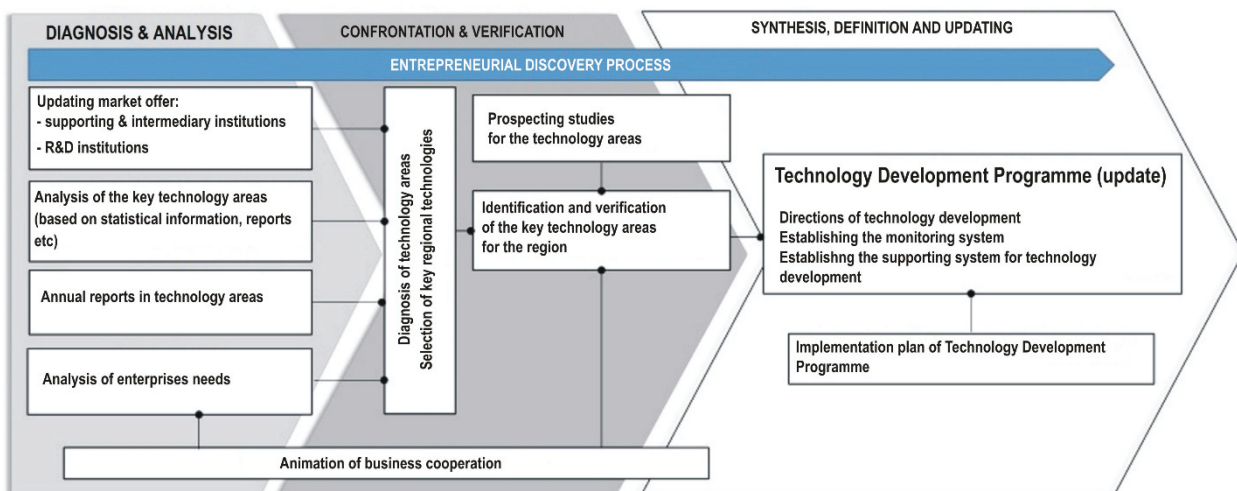


Figure 1 Process of updating Technology Development Programme, source: own elaboration of Technology Observatories Network

The practical result of entrepreneurial discovery process will be achieved thanks to the participation of enterprises. Every observatory have to prepare analysis of enterprise's needs. **Table 2** presents the number of enterprises participating in the analysis of needs realized by observatories. The enterprises involved in the analysis are also the partners of the observatories verifying the strategic decision included in Technology Development Programme. This decisions are revealed in Regional Operating Programme - main source for financing projects in the region.

Table 2 Number of realized enterprise's needs analysis by technology observatories

No	Technology area of the observatory	Consortium lider	Number of enterprises participating in analysis of needs
1	Medicine	Upper Silesian Agency for Entrepreneurship and Development in Gliwice	65
2	Environmental protection	Central Mining Institute	33
3	ICT	Technopark Gliwice	36
4	Energy	"Euro-Centrum" scientific park in Katowice	48
5	Nanotechnology	University of Silesia, Katowice	30
6	Material production and processing	Silesian University of Technology	37

4. CONCLUSION

The role of the technology observatory seems to be crucial in the light of the presented facts about the activities of observatory. There are also lack of other approaches to analyze technology trends from the practical purposes - an existing alternative for this activity is independent activities of enterprises in this field.

We can also point out the following conclusions:

- 1) The regional technological observatories are very rarely observed concept for analysis technological development. Śląskie in this context is very specific region creating the network of technology observatories. It's usability can be evaluated by the entities using and implementing the knowledge provided by the observatories: enterprises and regional policy-makers.
- 2) The practical value of the regional technology observatories can be evaluated in a few years, answering the questions how the observatories help the regional enterprises in improving their technological potential and how the observatories help regional decision makers in their strategic choices.
- 3) One of the most important results of the technological observatories in Śląskie is Technology Development Programme - strategic document supporting regional development and innovation strategy.
- 4) There is a close relation between activities of regional observatories and regional smart specializations, especially in the areas of technology analysis, monitoring and establishing cooperation between businesses.
- 5) Political factors might be a significant threat to objectivity of the regional observatories. Technology assessment for the strategic decisions establishing public support for certain technologies from the beginning assumed the role of political factors. The prevention of politicization of technology observatories could be based on transparency of activities, scientific methods and involvement of civil society (observatories acting as non-governmental organization).

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