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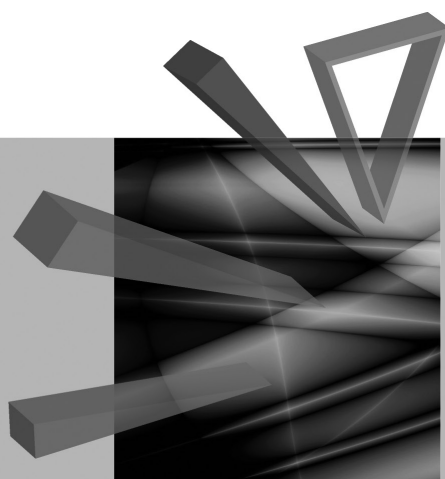
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BARRIERS TO INNOVATION ACTIVITIES IN INDUSTRIAL ENTERPRISES BY POLISH REGIONS IN 2004–2006 AND 2008–2010

Summary: Barriers to innovation activities in industrial enterprises are identified based on the *Oslo Manual* [2005] guidelines. The assessment of these solutions, and especially the level of their reference to public statistics, constitutes the theoretical part of this paper, while its empirical discussion concentrates on specifying the most significant barriers to innovation in industry referring to Polish regions in the periods of 2004–2006 and 2008–2010. The observed shortcomings (methodological, empirical) may become the reason for improving the PNT-02 report on innovation in industry, as well as a stimulus for undertaking indispensable activities aimed at weakening barriers hampering innovation activities in industrial enterprises.

Keywords: *Oslo Manual*, barriers to innovation activities.

1. Introduction

The objective of regional innovation policy is to increase the number and stimulate the efficiency of innovation processes. The effective implementation of its goals is influenced by an adequately created and fostered innovation focused climate by means of, among others, the identification and weakening of barriers hampering innovation oriented activities initiated by industrial enterprises. Does this situation occur in Polish regions? Are adequate statistical data collected? Do the disturbances in creating innovation and implementing capacity, recognized on their basis, become the focus of regional policy? The answers to the above questions constitute the core (goal) of this discussion.

2. Barriers to innovation activities – Oslo Manual guidelines

The Oslo Manual (2005) defines the rules for statistical materials collecting and interpreting with reference to broadly understood innovation at an enterprise level.

They include “guidelines for collecting data on the general process of innovation (for example, innovation activities, expenditures and linkages), the implementation of significant changes in the firm (i.e. innovations), the factors that influence innovation activities, and the outcomes of innovation” [*Oslo Manual...* 2005, p. 15]. The abundance of such problems results in the fact that relatively little attention is paid to factors hampering innovation activities. In general, they refer to obstacles of a financial, market and institutional nature and also barriers related to knowledge and other reasons for abandoning innovation processes (see Table 1). Difficulties specified in this classification do not always refer to all types of innovation. For example, the missing infrastructure does not constitute any barrier for organizational innovation, while problems in finding marketing partnerships, limit innovation only in this particular nature. The full spectrum of barriers for enterprise innovation, arranged in this way, may be identified by conducting due surveys in companies performing innovation activities, as well as those which are not involved in such projects. This standpoint is of significant importance, since there may occur certain reasons for totally abandoning innovation development and implementation, as well as reasons for slowing them down. Additionally, the situation cannot be disregarded when the actual effects of innovation activities may turn out differently from the expected. The different consequences resulting from innovation barriers explicitly indicate that factors which constitute barriers in developing and implementing new or significantly improved solutions present various overall impacts. Their weight (importance) has to be specified during surveys in order to recognize properly not only the set itself, but also the scale of problems characteristic for post-innovation enterprises [*Oslo Manual...* 2005, p. 112]. An open issue here is the frequency of the conducted surveys (*Oslo Manual* 2005 guidelines – every two years and if the economic situation does not allow it – once in three or four years, however, it is recommended to perform them every year [*Oslo Manual...* 2005, p. 129]).

The presented *Oslo Manual* guidelines are characterized by a relatively flexible framework. For example, the problem of particular innovation barriers’ weight (importance) may be approached in a different way. The above arrangement of due attributes may represent the actual measure in this matter, since they quantify the intensity of the analysed properties presented in a descriptive manner (e.g. 1, 2 and 3 referring respectively to: high, medium and low level of innovation activity hampered by a given factor). Another, and even better, solution seems to be the correlation of underlying reasons (factors responsible for barriers) with their potential effects. Among them the following may be listed: abandoning the innovation project in its conceptual or implementation phase, its realization postponement or only partial implementation. The scale of negative results, defined in this way, should be referred to the set of the most important, i.e. the most frequently occurring innovation barriers. In this respect the *Oslo Manual* guidelines seem correct, however, in some cases incomplete. This is particularly visible in the

area of factors responsible for financial (cost oriented) innovation rigidities. In this matter the absence of external financing sources is exclusively associated with obtaining funds within the framework of venture capital and public aid, disregarding at the same time, the availability of bank credits, loans from natural and legal persons, public debt, etc.

Table 1. Factors hampering innovation activities

Relevant for:	Product innovations	Process innovations	Organizational innovations	Marketing innovations
Cost factors:				
Excessive perceived risks	*	*	*	*
Cost too high	*	*	*	*
Lack of funds within the enterprise	*	*	*	*
Lack of finance from sources outside the enterprise:				
• Venture capital	*	*	*	*
• Public sources of funding	*	*	*	*
Knowledge factors:				
Innovation potential (R&D, design, etc.) insufficient	*	*		*
Lack of qualified personnel:				
• Within the enterprise	*	*		*
• In the labour market	*	*		*
Lack of information on technology	*	*		
Lack of information on markets	*			*
Deficiencies in the availability of external services	*	*	*	*
Difficulty in finding co-operation partners for:				
• Product or process development	*	*		
• Marketing partnerships				*
Organizational rigidities within the enterprise:				
• Attitude of personnel towards change	*	*	*	*
• Attitude of managers towards change	*	*	*	*
• Managerial structure of enterprise	*	*	*	*
Inability to devote staff to innovation activity due to production requirements	*	*		
Market factors:				
Uncertain demand for innovative goods or services	*			*
Potential market dominated by established enterprises	*			*
Institutional factors:				
Lack of infrastructure	*	*		*
Weakness of property rights	*			*
Legislation, regulations, standards, taxation	*	*		*
Other reasons for not innovating:				
No need to innovate due to earlier innovations	*	*	*	*
No need because of lack of demand for innovations	*			*

Source: [Oslo Manual... 2005, p. 113].

The Oslo Manual's shortcomings should be eliminated by, among others, considering the needs of statistical systems users. In this perspective – for example – a set of collected information may be developed regarding factors functioning as obstacles for innovation activities and it is also possible to narrow down the observed object (e.g. expand the set of innovation barriers and stop assigning them to substantive innovation types). These changes, however, have to be performed based on international consensus (statistical data comparability). Such a philosophy is followed by the Central Statistical Office (CSO).

3. Barriers to innovation activities in industrial enterprises – CSO statistics

A statistical picture of innovative activities carried out by enterprises was prepared based on reports about innovations in industry (PNT-02). Their compliance with international standards is guaranteed by the questionnaire prepared by the European Union and OECD experts (the Harmonized Survey Questionnaire). These studies are conducted within the framework of the *Community Innovation Survey* programme focused on the assessment of the scope and nature of the innovation activities carried out by enterprises representing different economy sectors in EU and EFTA countries [Explaining notes... 2008–2010, p. 12]. The identification of the factors functioning as barriers to innovation activities constitutes, among others, the significant part of the discussed problems (see Table 2).

Table 2. Innovation barriers in PNT-02 statistical report*

Factors hampering innovation activities		Impact level
Cost factors	lack of funds in an enterprise or in a group of enterprises	1 – high 2 – medium 3 – low 4 – insignificant
	lack of funds from external sources	
	innovation costs too high	
Knowledge factors	absence of qualified personnel	
	lack of information regarding technology	
	missing information about markets	
Market factors	problems in finding cooperation partners for innovation projects	
	market dominated by established enterprises	
	uncertain demand for innovative (new) products	
Other factors	no need to perform innovation activities due to innovations implemented in previous years	
	absence of demand for innovations	

* Data on innovation in industry [PNT-02] are collected annually, however, not in relation to barriers for innovation activities. Information about it were collected in 2007 and 2011 (see <http://form.stat.gov.pl/formularze>).

Source: own elaboration based on [PNT-02... 2004–2006, 2008–2010].

The accepted solutions regarding survey registration of innovation activities barriers are worth evaluating against the background of the *Oslo Manual 2005* guidelines. In such a perspective, attention has to be paid to the fact that the scope of collected information, within the framework of the PNT-02 report, is in many respects more limited than it should be in accordance with the formal recommendations. This report from (see Tables 1 and 2):

- ceases correlating innovation barriers with innovation types,
- disregards institutional factors (absence of infrastructure, weakness of property rights, legislation, legal regulations, standards, taxation) by eliminating them from innovation barriers for companies,
- frequently reduces types of obstacles which may occur in a certain group of factors hampering innovation activities (e.g. factors referring to knowledge do not cover: organizational rigidity inside an enterprise, insufficient innovation potential, etc.),
- aggregates Oslo Manual items (e.g. lack of external funds without distinguishing barriers related to venture capital availability and sources of public funds).

The reduced set of factors recognized as barriers for innovation activities influences adversely the accepted method for their impact intensity assessment. Its measure is represented by the arrangement of attributes which define the impact level of particular barriers as high, medium, low or insignificant (respectively: 1, 2, 3 and 4). In the perspective of such Oslo Manual guidelines interpretation, the possibility for defining the consequences of the occurrence of certain barriers disappears, while the need for it is signalled by, at least, the 2007 report form (PNT-02 for the period of 2004–2006). In its structure the identification of innovation activities barriers, applying the above presented scale of assessment, is preceded by the following question: “Was there at least one project, in the period of 2004-2006, related to innovation which was not at all initiated (abandoned in the phase of concept preparation), interrupted while in progress (stopped after its initiation) or extensively delayed?” [PNT-02... 2004–2006, p. 4]. Including this issue in the PNT-02 report does not solve the problem, since there is no possibility to correlate an answer to the presented question and the level of innovation activity reduction (high, medium or low). A better solution seems, as has already been mentioned, to refer to factors hampering innovation activities to the effects they may bring about (e.g. abandoning a project in its preparation phase, etc.).

The lack of precision in the *Oslo Manual* is related not only to the flexibility of solutions (e.g. “It is recommended to collect data on barriers to innovation activity and their **relative importance** for the period under review” [*Oslo Manual...* 2005, p. 112], but also to many underlying variants of possible solutions. The guidelines regulating the frequency of surveys’ organization and conducting are an excellent example in this matter (once, twice, three or four times a year). The CSO,

following these guidelines, decided to collect information about innovations in enterprises once a year, however, not in full. The factors constituting barriers to innovation activities are identified once in four years. The latest surveys of this type were performed in 2007 and 2011 and covered 3-year periods (2004–2006 and 2008–2010). Such periodicity does not seem to correlate with the needs of statistical systems users and especially the entities involved in regional innovation policy.

The listed shortcomings of the statistical data collecting system, regarding barriers to innovation activities in industrial enterprises, narrow down the area of the conducted analyses, however, they allow for putting forward certain general observations.

4. Barriers to innovation activities in industrial enterprises in Polish regions

Barriers to innovation activities in industrial enterprises are diagnosed based on the survey questionnaire prepared by the European Union and OECD experts. They take the form of classical questionnaire questions with a prepared set of answers. The PNT-02 form lists eleven barriers arranged in four groups which may to a high, medium or low extent reduce innovation activities in enterprises, or do not influence it at all. In the accepted scale of assessing the identification of the most important innovation activity barriers should be associated with the significant percentage of respondents qualifying the importance of a given factor as “high” in the overall number of industrial enterprises (see Table 3). Additionally, while presenting the general conclusions in the spatial system, attention should be paid to the minimal percentage of such indications in 16 Polish regions (voivodships), since such a minimum means that the problem refers to all regions in, at least, such a scale. This perspective allows for the following observations:

- cost factors represent a major barrier for innovation activities in industrial enterprises, mainly due to extensively high innovation costs. In the period of 2004–2006, the minimal percentage of indications pointing to the high level of this factor’s influence amounted to 30.4% (Podkarpackie region), which was most probably related to the absence of funds in enterprises or their groups (min. 28.3%; Lubuskie region), or the unavailability of these funds from external sources (min. 22.6%; Pomorskie region). These problems have slightly intensified, which raises concerns, in the subsequent reporting period (2008–2010) when the minimum percentage of indications towards the high importance of the listed factors presented the respective levels: 31.5% (Kujawsko-Pomorskie region), 28.8% (Małopolskie region) and 24.5% (Kujawsko-Pomorskie region);
- market factors reduce the capacity of industrial enterprises towards creating and implementing innovation to a much lesser extent than in the case of cost barriers, even though they are ranked as second among the obstacles hampering

Table 3. Factors hampering innovation activities in industrial enterprises by voivodships during 2004–2006 and 2008–2010

Specification	Cost factors						Knowledge factors						Market factors				Other factors					
	lack of funds within the enterprise or group		lack of finance from sources outside your enterprise		innovation costs too high		lack of qualified personnel		lack of information on technology		lack of information on markets		difficulty in finding cooperation partners for innovation		market dominated by established enterprises		uncertain demand for innovative goods or services		no need due to prior innovations		no need because of no demand for innovations	
	enterprises which marked “high” degree of importance relevant factor as % of total enterprises																					
	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010	2004–2006	2008–2010
Poland	34.7	31.8	27.7	26.9	34.5	34.2	10.7	14.6	6.5	12.4	6.2	11.8	12.4	16.7	19.6	21.1	20.3	21.7	7.6	14.4	11.4	14.8
Dolnośląskie	36.7	32.8	29.7	26.7	36.4	34.7	10.1	15.7	5.3	12.3	4.9	12.8	9.5	17.9	19.7	22.0	19.0	21.5	8.7	13.4	11.2	15.0
Kujawsko-Pomorskie	35.0	30.0	26.7	24.5	31.6	31.5	10.3	14.7	7.7	12.6	6.9	11.4	10.9	15.9	16.6	19.2	18.1	20.1	7.8	13.3	12.4	13.5
Lubelskie	39.5	38.5	31.0	29.9	39.9	37.3	10.4	16.1	8.2	13.4	6.1	13.7	14.6	19.3	19.2	24.2	19.6	25.9	7.8	14.7	10.9	16.4
Lubuskie	28.3	35.2	23.8	31.3	33.3	36.2	13.2	17.8	5.4	15.0	7.5	13.3	10.1	18.5	17.8	22.3	23.6	23.3	5.0	17.1	10.9	17.1
Łódzkie	32.7	30.5	26.2	25.5	30.9	32.4	9.7	13.9	7.1	11.3	7.0	11.6	14.9	16.9	19.4	21.4	25.6	23.7	10.2	14.6	16.7	14.6
Małopolskie	37.4	28.8	27.0	25.7	32.3	33.8	10.4	14.3	5.4	11.5	6.8	10.8	13.1	15.2	20.9	21.7	23.6	21.0	6.7	14.5	10.8	14.3
Mazowieckie	40.0	30.7	35.7	27.0	39.3	33.0	12.2	14.9	6.4	12.7	6.1	11.8	14.9	17.3	22.2	21.8	21.7	21.4	8.5	13.6	11.5	15.3
Opolskie	33.1	30.1	25.7	26.3	35.8	35.3	12.9	15.1	3.5	12.8	3.7	11.2	10.9	16.7	16.8	20.9	17.5	21.1	3.8	15.7	11.2	17.3
Podkarpackie	33.5	38.5	28.2	34.1	30.4	38.5	8.7	15.5	6.9	14.3	4.2	13.5	11.9	19.3	16.7	24.0	17.3	23.6	7.1	15.4	6.3	15.1
Podlaskie	41.7	36.0	33.5	30.7	38.3	39.6	15.7	17.4	11.5	12.8	9.5	11.5	14.2	17.1	16.3	25.4	23.8	24.6	12.0	14.3	10.7	13.9
Pomorskie	30.7	29.6	22.6	25.6	30.4	33.9	11.1	14.1	6.7	12.5	6.0	12.4	10.2	15.8	15.0	20.6	14.2	21.1	5.9	13.8	7.6	14.8
Śląskie	31.9	30.9	25.6	27.0	33.1	34.1	8.9	13.5	6.8	11.4	6.5	10.7	12.0	15.8	21.6	20.3	21.1	21.1	7.9	13.3	11.2	13.5
Świętokrzyskie	35.5	34.5	26.5	25.3	36.2	35.1	9.8	13.6	4.6	12.2	4.1	11.1	14.2	15.4	21.4	19.8	18.2	22.4	5.6	15.8	9.3	15.3
Warmińsko-Mazurskie	41.0	34.7	28.7	26.4	35.6	35.5	10.6	15.4	8.2	12.9	6.6	12.0	13.4	16.9	16.1	21.3	17.1	21.4	8.1	16.6	8.7	15.4
Wielkopolskie	30.8	30.6	24.4	25.1	34.3	33.3	11.2	13.6	5.4	12.2	6.3	11.4	9.4	15.7	21.5	19.3	18.0	20.0	5.5	14.4	11.1	14.4
Zachodniopomorskie	31.1	33.6	24.0	28.2	36.2	35.1	11.7	15.0	6.8	13.8	6.0	13.6	14.8	18.6	18.8	19.3	21.6	21.1	9.2	16.4	18.3	16.2

Source: own elaboration based on [Innovation... 2012, p. 248; Innovation... 2008, p. 163].

innovation activities. In the period of 2004–2006, the minimum percentage of indications towards their high importance ranged from 14.2% (uncertain demand for innovations/new/ products) up to 15% (a market covered by dominating enterprises) and was registered in the Pomorskie region. This situation did not change in the period of 2008–2010, even though the thresholds of these indications did change (uncertain demand for innovations/new/products – 20.0% in the Wielkopolskie region, the market covered by dominating enterprises – 19.2% in the Kujawsko-Pomorskie region);

- barriers related to knowledge and other obstacles hampering innovation activities did not present major problems in the system of Polish regions.

The observed irregularities are confirmed by data for all the industrial enterprises (see Poland – Table 3), which explicitly indicate that the fundamental barriers for innovative activities in the periods 2004–2006 and 2008–2010 were caused by difficulties related to cost oriented factors, followed by the market ones. It is also worth emphasizing that slight changes in the percentage of indications towards these particular factors in the two subsequent reporting periods reveal the passive or ineffective nature of innovation policy with regard to these barriers.

5. Conclusions

Barriers to innovation activities in industrial enterprises are identified based on Oslo Manual guidelines, however, to a much lesser extent (the PNT-02 Report on innovation in industry), which deepens the shortcomings of their prototype. The collected data do not seem to meet the expectations of statistical systems users and especially the entities of regional innovation policy. The low effectiveness of their operations cannot, however, be excused by the shortcomings in the Harmonized Survey Questionnaire. Data for the periods 2004–2006 and 2008–2010 invariably show that cost factors and market factors are responsible for the most important barriers to innovation activities in Polish regions. Such a situation will not change in the reporting period to follow unless adequate action is undertaken.

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**PRZESZKODY DZIAŁALNOŚCI INNOWACYJNEJ
PRZEDSIĘBIORSTW PRZEMYSŁOWYCH
WEDŁUG REGIONÓW POLSKI
W LATACH 2004–2006 I 2008–2010**

Streszczenie: Przeszkody działalności innowacyjnej przedsiębiorstw przemysłowych są identyfikowane w oparciu o zalecenia *Oslo Manual* [2005]. Ocena tych rozwiązań, a zwłaszcza stopnia ich przełożenia na statystykę publiczną, wypełnia teoretyczną część artykułu. Jego empiryczne rozważania koncentrują się na ustaleniu najistotniejszych barier innowacyjności dla przemysłu w polskich regionach w latach 2004–2006 i 2008–2010. Zauważone nieprawidłowości (metodyczne, empiryczne) mogą być przyczynkiem do dopracowania sprawozdania PNT-02 o innowacjach w przemyśle, a także impulsem do podjęcia niezbędnych działań na rzecz osłabienia barier działalności innowacyjnej przedsiębiorstw przemysłowych.

Słowa kluczowe: *Oslo Manual*, bariery działalności innowacyjnej.