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Thomas BAAKEN, Sue ROSSANO, Friederike VON HAGEN, Todd DAVEY, Arno MEERMAN[1]

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UNIVERSITY-BUSINESS COOPERATION AND ENTREPRENEURSHIP AT UNIVERSITIES – AN EMPIRICAL BASED COMPARISON OF POLAND AND GERMANY

Summary

The EU's growth strategy for the coming decade (recorded and defined by Horizon2020) and the higher education modernisation agenda force all European countries to establish a more connected and better functioning relationship between the three most important players government, business and higher education institutions (HEI's) in order to increase employment, productivity and social cohesion.

This article explores the development of University-Business Cooperation (UBC) both in Poland and in Germany, shining a spotlight on the various factors influencing UBC, as well as providing a comparison of the two countries. The focus lays on a Polish-German comparison i.e. the compared analyses of the state of UBC in Germany and Poland from the perspective of HEI managers and researchers.

Applying a UBC-ecosystem of different factors and action levels (http://ub-cooperation.eu/pdf/UBCECO.pdf) the major differences of both countries are identified, addressed and commented to offer opportunities for improvements.

This paper describes and discusses selected findings of a study, which had been conducted for the European Commission to analyse University-Business Cooperation in 33 European countries by the S2B Marketing Research Centre at Münster University of Applied Sciences.

Key words: University-Business Cooperation (UBC), Higher Education Institutions (HEIs), Entrepreneurship at Universities in Europe, Eco-System in UBC, Poland-Germany

1. Introduction

Over the last 30 years, the role of higher education institutions (HEIs) has undergone a major change. Although HEIs have been collaborating with business since

[1] Prof. Dr. hab. Thomas Baaken – Science-to-Business Marketing Research Centre, Münster University of Applied Sciences Germany; e-mail: baaken@fh-muenster.de. Sue Rossano, M.A. – Science-to-Business Marketing Research Centre, Münster University of Applied Sciences, Germany/Vrije Universiteit Amsterdam, The Netherlands; e-mail: rossano@fh-muenster.de. Friederike von Hagen, Dipl.-Kffr. – Science-to-Business Marketing Research Centre, Münster University of Applied Sciences, Germany; e-mail: fvonhagen@t-online.de. Todd Davey, Ph.D. – Science-to-Business Marketing Research Centre, Münster University of Applied Sciences, Germany; e-mail: davey@fh-muenster.de. Arno Meerman, M.A. – Science-to-Business Marketing Research Centre, Münster University of Applied Sciences, Germany; e-mail: meerman@fh-muenster.de.

the 1800's, more recently the focus and intensity of those activities have been rapidly advancing [Etzkowitz, 2001]. Nowadays, HEIs are expected to not only deliver on the first two missions of teaching and research, however the third mission of regional and society engagement is increasingly emphasised [Sam, Van der Sijde, 2014] and HEIs have become centres of potential economic and social development [Geuna, Muscio, 2009].

At the same time, for companies, innovation is increasingly likely to come from outside of the individual firm with a more open innovation supply chain being experienced. HEIs are increasingly being recognised as a source of science or technology developments [Baaken, 2013]. The rise of globalised knowledge has intensified the need for strategic partnerships that go beyond the traditional sources of innovation. Increasingly companies and universities are working together to push the barriers of knowledge, and in doing so, become a powerful engine for innovation and economic growth.

For this reason, HEIs are more actively involved in developing and marketing their innovations which in effect forces the HEI to undertake entrepreneurial activities especially with reference to the economic growth [Franco, Haase, 2010; Baaken, 2015]. Despite this shift in priorities, the university itself and its culture has been slower to respond with questions about the suitability of the university for this role being discussed and indeed whether it is even desirable to have business influence the curriculum [Gillis, McNally, 2010; Barnett, 2002] or research agendas [Carayol, 2003].

University Business Cooperation (UBC) has been defined as different types of interaction between the industrial sector and the HEIs which are aimed at transfering knowledge and technology [Santoro, Bierly, 2006]. "Entrepreneurial universities" encourage the partnerships between academics and entrepreneurs which can produce remarkable results and benefits for both partners.

UBC has traditionally been associated with cooperation in R&D and commercialisation of research. In a study into the forms of collaboration between universities and business, commercialisation and research and development collaboration were found to be just two of the eight types of UBC [Davey et al., 2011]. However, in recent years the concept of what is considered to be UBC has been extended to recognise all the ways in which HEIs can contribute to society. A set of the so-called newer types of UBC have been increasingly recognised such as lifelong learning (LLL), entrepreneurship, collaborative and professional mobility between academia and business as a means to achieve the third mission [Davey, 2015].

Some authors have looked at those issues to represent a wider array of knowledge transfer activities including entrepreneurship [Jones-Evans, Klofsten, 2000]. These authors defined 'academic entrepreneurship' as the academic's engagement in entrepreneurial activities in addition to their normal academic duties to link up with business in their region. and as the introduction of novelties in processes [Etzkowitz, Leydesdorf, 2000; Laredo, 2007] and research [Louis et al., 1989]. Such a broader definition acknowledges the dynamism and heterogeneity of academics and their motivations for carrying different UBC and entrepreneurial activities.

Owing to this, the holistic extraction of value via UBC has become more important for the viability and relevance of HEIs as the benefits of closer and better coo-

peration between HEIs and business and the benefits for the students have been increasingly recognised.

However, despite the illustrated prominence of UBC, there is still a lack of analysis on the extent of UBC within European HEIs, including the types of mechanisms that exist for UBC or the barriers and drivers influencing it. Although in the UK, UBC has received more attention [Wilson, 2012; Witty, 2013], in the German and Polish settings, UBC is still an under-researched area. Given that each European nation has its own policies and practices, limits effective European approaches to UBC [Geuna, Nesta, 2006]. Furthermore, cultural aversions and these policy differences have included legal prohibitions on academic engaging with industry as well as academic entrepreneurship [Owen-Smith et al., 2002].

Therefore, a strategic approach is needed in order to assess and extract value from the university environment most effectively benefiting all relevant stakeholders in the ecosystem. This will be addressed through the execution of this study, which will review this ecosystem for both Germany and Poland. It will specifically review the extent of collaboration happening in both nations as well as the types of collaboration occurring. Furthermore, a set of factors influencing UBC including the main barriers, drivers and perceived benefits identified for both of them will be measured and analysed. Finally, the importance of the influence of a series of supporting mechanisms will be tested.

The study is based on the data collected in a project on the cooperation between HEIs and public and private organisations in Europe conducted by the Science-to-Business Marketing Research Centre, Germany (S2BMRC) for the European Commission between 2010 and 2011.

A triangulation methodological approach was used as it was considered the most appropriate method for this kind of topic as it provides much more robust and reliable results. Firstly, research was conducted with a wide literature review, including academic and scientific journals together with reports and conference papers. A qualitative research was conducted, including in-depth interviews with experts in UBC at European level and an on-line questionnaire was sent to all registered HEIs in Europe.

This paper is specifically focusing on UBC in the context of Entrepreneurial Universities in Poland and Germany. With Germany being the birthplace of the Humboldt University concept, whereby universities are considered to be bastions on pure knowledge generation with independence from governments and the business world [Boulton, Lucas, 2011], and both Poland and East Germany having been part of communist Europe during the 20th century, there are unique factors affecting universities in these countries. These factors will be explored in the study.

2. Entrepreneurial University-Business Cooperation – A Comparison of Poland and Germany

The following section provides a background to the subject nations of the study, Poland and Germany generally and more specifically in relation to UBC.

2.1. Poland

During the last 25 years the Polish landscape of innovation development has changed dramatically. Poland had and has to overcome this disruptive change and is facing deep transitions. Today it is heading towards a more entrepreneurial way [Pniewska et al., 2014; Pierścieniak, 2015]. Since 1990 Polish companies had to face competition with those from the developed countries. Their success was depending on whether they could hold its own with suitable commitment against strong competitors in Europe. But starting to face those challenges many Polish companies immediately lost the free market competition.

The situation was characterised by three key impact factors:

1. One of very few competitive advantages of the Polish economy was its relatively cheap workforce, yet it was also less qualified.
2. A second weighting disadvantage was identified in the low-level technology only available in the country. High technology though is mainly developed in University-Business Cooperation and the Science-Business Partnerships. [Teczke, 2010].
3. Operations of former society and economy was based on central political control and surveillance, which caused potential distrust from the very beginning of each party [Jasiński, 2010].

In order to become more competitive an increased focus on (higher) education and – particularly – in developing UBC and Science-Business Partnerships is required. Regional development is to a great extend depending on this [Franco, Haase, 2010]. However, Polish universities were never truly used to facilitating the cooperation with industry, but focused more on basic research and theoretical education. Additionally, like other emerging economies, companies have less funds for R&D at their disposal [Pniewska et al., 2014]. Therefore, today's task is to start building trust and mutual commitment [Plewa et al., 2006; Plewa, 2010] in cooperation, partnerships and alliances [Cyert, Goodman 1997; Franco, Haase, 2012].

A special situation of Poland is based on its recent history. Poland is nowadays a society in transition [Teczke, Terblanche, 2013]. Two turning points have caused inconsistency and disruption of the situation 1989: a collapse of a centrally-planned system and 2004: the formal membership in the EU. Ten years later, in 2014, Poland celebrated its 25th anniversary of EU membership. Some figures are providing evidence on the economic change.

TABLE 1.

Poland in transition

	1994	2004	2014
GERD[1)]/GDP	0.90	0.58	0.90
Domestic patent submissions	4 105	2 381	4 410
Domestic patents issued	3 242	778	1 848
Innovation intensity	0.8	2.2	1.7

[1)] Gross Domestic Expenditures on Research & Development

Source: [Jasiński, 2014; Weresa, Lewandowska, 2014].

Also Poland introduced a number of new laws, legal regulations and incentives to enhance innovation in the country.

TABLE 2.
Objectives of legal regulations to support innovation in Poland

	Private actors	Public actors
Organisational solutions	Establishment of a private R&D sector	Better quality of innovation policy on the national and regional level
Financial solutions	Increasing innovative activity of private sector entities as measured by higher R&D spending	Better allocation of public resources for innovative activities

Source: [Weresa, Gomułka, 2006]

Today Poland is developing fast but still is struggling with some weaknesses in its National Innovation System.

TABLE 3.
Strengths and weaknesses of Polish National Innovation System NIS

Strengths	Weaknesses
– high potential of R&D workers (the potential is not too big but is situated far from the market) – well-educated and skilled technical staff in enterprises: relatively many engineers work in industry – lower – in comparison with the West – costs of labour force in general and including wages of R&D workers – modern technical equipment in some sectors	– a weak R&D potential within firms – obsolete technologies and old equipment in many sectors of industry – an insufficient number of TT brokers / bridging institutions between R&D sector and industry – a small role played by SMEs in the development of new technologies – a lack of sufficient marketing experience in numerous research institutions

Source: [Jasiński, 2014].

2.2. Germany

Germany has a broad range of public HEIs differing in its transfer and partnership activities. The public research infrastructure in Germany can be subdivided into three groups: traditional universities, universities of applied sciences, and non-university research.

Scientists at traditional universities as well as in universities of applied sciences, which make up 70 percent of the national research volume, spend most of their time in teaching duties and only little time on research [Beise, Stahl, 1999].

Germany's public research infrastructure evolved in a complex environment characterised by the traditional perception of science as a value in itself and by the demand from industry, by the inertia of public institutions and tensions between federal and

state responsibility for education and research. Universities have a long tradition of research and science reaching back to the middle ages. Universities of social and natural science are known mostly for teaching and basic research without aiming at any commercialization and partnership activities to industry. In contrast, technical universities have a long tradition of industry-related research. They were formed during the last century to enhance inventions and technical applications of scientific findings but have subsequently focused on basic research [Knie et al., 2002; Keck, 1993].

Universities of applied sciences have a special role in Germany. Often, they are specialised in the same technical fields as local businesses and are supposed to support small and medium sized firms through consultancy and the supply of graduates. They focus mainly on teaching, however also conduct research but on a much smaller scale than universities. They are now widespread within Germany and have gained a reputation for down-to-earth research and applicable engineering know-how, compensating the shortcomings of universities that are oriented towards basic research.

Both types of universities nowadays are pushed by politics and society to foster UBC to make science results available and to gain third party money from industry [Kliewe et al., 2013; Knie et al., 2002].

But in Germany the separation of pure and applied science was traditionally institutionalised in universities of technical and natural sciences. But it was not until the integration of the Fraunhofer-Society (and a number of other major research organisations such as the Max Planck Society or Leibniz Society) as the third pillar of the German public research system, that the division between basic and applied research was officially carried out in the non-academic public research sector as well. Those organisations are however closely linked to universities due to their research tasks often based on PhD candidates.

A first view on some general and specific figures characterizing the two countries allows some conclusions but also raised further questions.

2.3. A general and specific spot light on the two countries

Comparing specific factors, it can be seen that Germany is ranked as markedly superior environments as compared Poland. Perceived opportunities and the high status to successful entrepreneurs particularly highlight the differences despite higher perceived capabilities, entrepreneurial intentions and entrepreneurship being a good career choice being higher in Poland.

In respect to the availability or presence of resources, once again Germany come out ahead with the global innovation index ranking both better environments for innovation. The link between GDP per capita and student entrepreneurial intentions have been recognised [Davey et al., 2011], and again, Germany is superior. This is reinforced in their greater investment in both research per capita, particularly in Germany, as well as the availability of human and technical resources.

TABLE 4.

Country comparisons

	Data area	Assessment criteria	Poland	Germany
Entrepreneurship Specific factors[1]	*Specific factors*	Ranking from the GEM	43	5
		Perceived opportunities	26.1	31.3
		Perceived capabilities	51.8	37.7
		Fear of failure	46.7	38.6
		Entrepreneurial intentions	17.3	6.8
		Entrepreneurship as a good career choice	66.8	49.4
		High status to successful entrepreneurs	59.9	75.5
		Media attention for entrepreneurship	58.5	49.9
Resource-specific data[2]	*Financial Resources*	Global innovation index 2014	40.6	56
		GDP per capita 2014	23 273	43 475
		Government expenditure on R&D as a percentage of GDP	0.9	2.92
		% of government spending on total education	11.4	10.6
	Human resources	Number of researchers per 1 million people	1 753	4 139
	Technological resources	High-technology exports ($ million)	9 559.86	183 354.36
		Patent applications by residents	4410	46620
EFC [3]	*Institutional & policy frameworks (Worldwide Governance Indicators 2014- Governance Scores - 2.5 to +2.5)*	Political stability	0.95	0.93
		Government effectiveness	0.71	1.52
		Regulatory quality	1.05	1.55
		Rule of law	0.79	1.62
		Control of corruption	0.55	1.78

Source: [1 – GEM, 2014; 2 – Cornell University, INSEAD, and WIPO, 2014; 3 – The World Bank, 2014, Weresa, 2015].

The pattern of superiority continues in assessments of Entrepreneurial Framework Conditions with Germany, both rated more highly than its eastern counterpart with control of corruption an issue in Poland.

Despite this simplified view whereby Germany and Poland agglomerated, differences between the Polish and German environments exist.

3. Methodology of the empirical research

The data and survey presented in this paper was collected as part of a public tender for the European Commission labelled "The cooperation between HEIs and public

and private organisations in Europe", which ran from 2010 to 2011 across 33 countries in Europe. The main components of the study were

1. in-depth qualitative interviews with 11 recognised UBC experts which served as a brain pool for a major quantitative survey;
2. 30 Good Practice Case Studies in Europe;
3. a large-scale quantitative survey which was translated into 22 languages and sent to three managers in each registered European HEIs (3.551) in 33 countries during March 2011.

The results outlined in this paper are based on the third component, namely the survey. The distributed of survey was done using a two-step method. The survey was distributed to HEI managers, requesting them to (1) complete the survey themselves, as well as (2) forward the survey to their academics and technology transfer agency or other internal bodies dealing with University-Business Collaboration (e.g. entrepreneurship centres, innovation centres and incubators).

A total net sample of 6.280 academics and HEI management was achieved making the study the largest study into cooperation between HEIs and business yet completed in Europe.

Questions were posed to two groups within HEIs. These groups were asked about their perception of UBC:

1. Individual academics were asked to respond on behalf of themselves.
2. HEI management (HEI managers and university professionals working with industry) were asked to respond on behalf of their HEI.

This data has been analysed using IBM SPSS Statistics 20.0, first filtering the data to use only the data from the European countries of Germany and Poland.

This has led to a remaining group of, 461 academic responses from Polish academics, of which 57.4% were male and 42.6% female, as well as 240 responses from German academics, of which 73.9% were male and 26.1% female. In addition to the academic responses, university managers were also surveyed with 159 and 281 responses from Poland and Germany respectively.

For the purpose of this paper, we focussed on a comparative means test to analyse the differences between the German and Polish HEI managers, as well as Kruskal Wallis to test the significance of the difference between German and Polish respondents. The analyses focussed on the dependent variables:

1. the extent of University-Business Collaboration in their institution for each of the eight types of University-Business Collaboration,
2. the extent of development of the strategies, structures and approaches, operational activities in their institution,
3. the extent of relevance of the barriers hindering university-business collaboration,
4. the extent of relevance of the drivers supporting university-business collaboration and
5. the perceived benefit from undertaking university-business collaboration.

With the independent variables being the countries (i.e. Germany and Poland).

Their responses on the dependent variables were given on a scale of 1 to 10, with 1 being the lowest and 10 being the highest response.

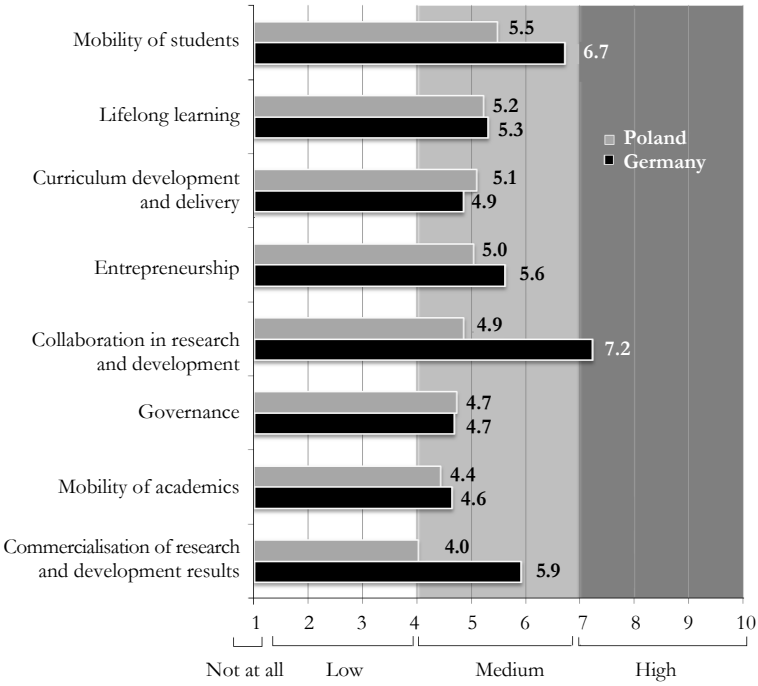
4. Results

Results are structured into three primary areas of enquiry, the extent of overall UBC, the factors influencing collaboration as well as the mechanisms supporting UBC in both Germany and Poland.

4.1. Extent of collaboration

The following results present the responses received from university management in respect to the perceived development of eight types of cooperation recognised between university and business [Davey et al. 2011].

CHART 1.
Extent of UBC perceived by university management in Germany and Poland



Source: Own elaboration.

There is a high degree of diversity in the development of the different types of UBC in Germany, with 'collaboration in R&D' (7.2), 'mobility of students' (6.7) and 'commercialisation of R&D results' (6.7) being the most developed types, exhibiting a focus

on research-related UBC. 'Mobility of academics' (4.6), 'governance' (4.7) and 'curriculum development and delivery' (4.9) are, on the other hand, the least developed forms.

In comparison to Poland, Kruskal-Wallis test shows that German HEI management report a significantly higher extent of development in 'collaboration in R&D', 'mobility of students', 'commercialisation of R&D results' and 'entrepreneurship'. 'Curriculum development and delivery' is higher in Poland, which also has as the highest forms of cooperation 'student mobility' and 'lifelong learning', showing how Polish universities have a focus on education-related UBC.

4.2. Factors influencing the extent of UBC

The extent to which a number of factors affect cooperation with business in Germany and Poland will now be outlined. These factors have been found to significantly influence cooperation within the European context [Davey et al. 2011] and include barriers, drivers and perceived benefits received from UBC.

4.2.1. Barriers hindering UBC

Barriers are those obstacles that restrict or inhibit the ability of academics or HEIs to engage in UBC. The following figure explains the extent of relevance of barriers to UBC by both German and Polish university managers and stated as averages.

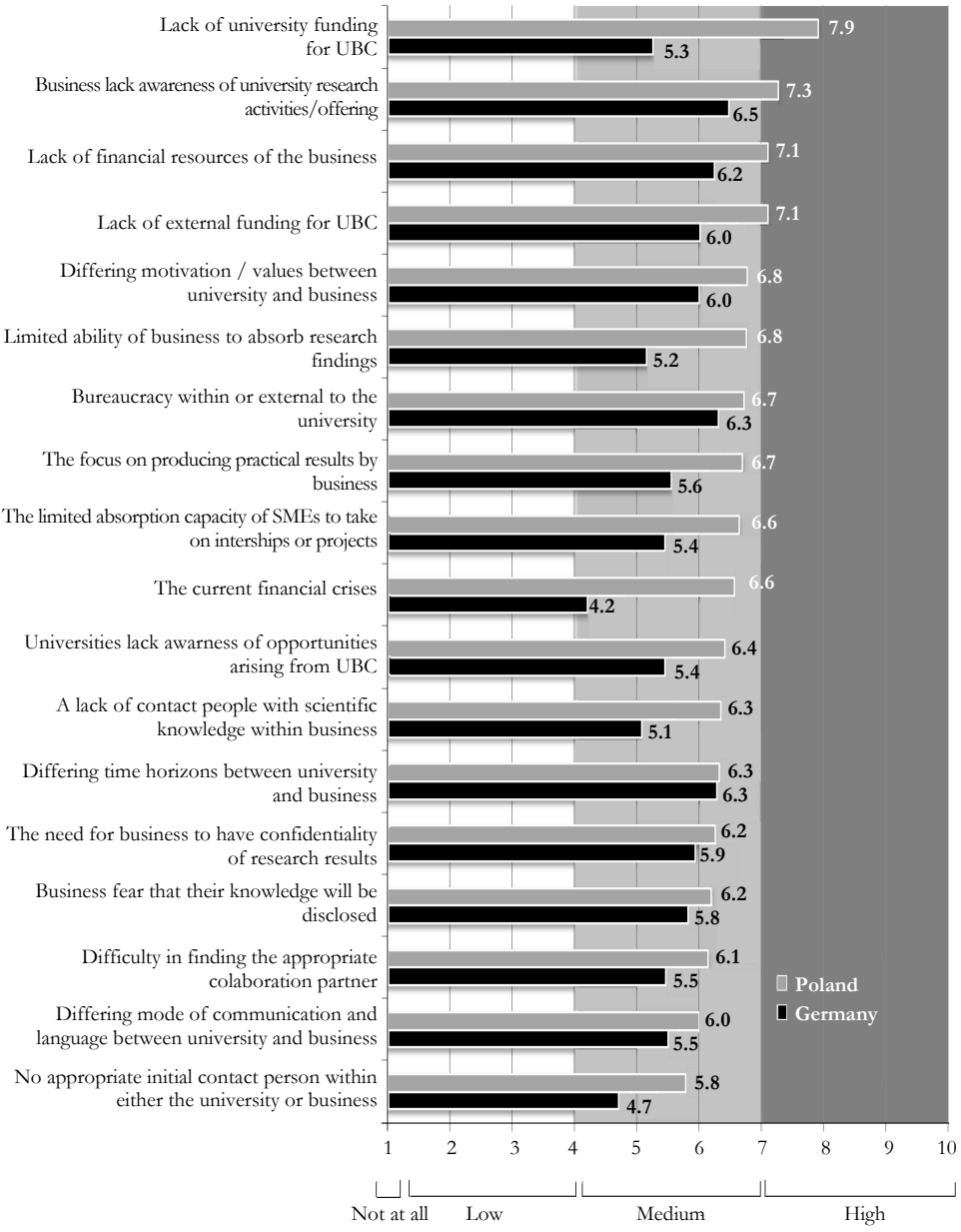
Within the German context, university management perceived the major UBC barriers as 'business lack awareness of university research activities/offerings', 'bureaucracy within or external to the HEI' and 'lack of financial resources of the business'.

It can be observed that in Poland, with 'lack of HEI funding', 'lack of financial resources of the business' and 'lack of external funding' to be three of the top four barriers, showing how funding is perceived to be major issues hindering Polish UBC.

Overall, Germany university management perceived a lower level of barriers than their Polish counterparts for all barriers analysed. The Kruskal-Wallis tests show that all differences are statistically significant except those related with confidentiality of results, different communication and different time horizons.

CHART 2.

UBC barriers perceived by university management in Germany and Poland

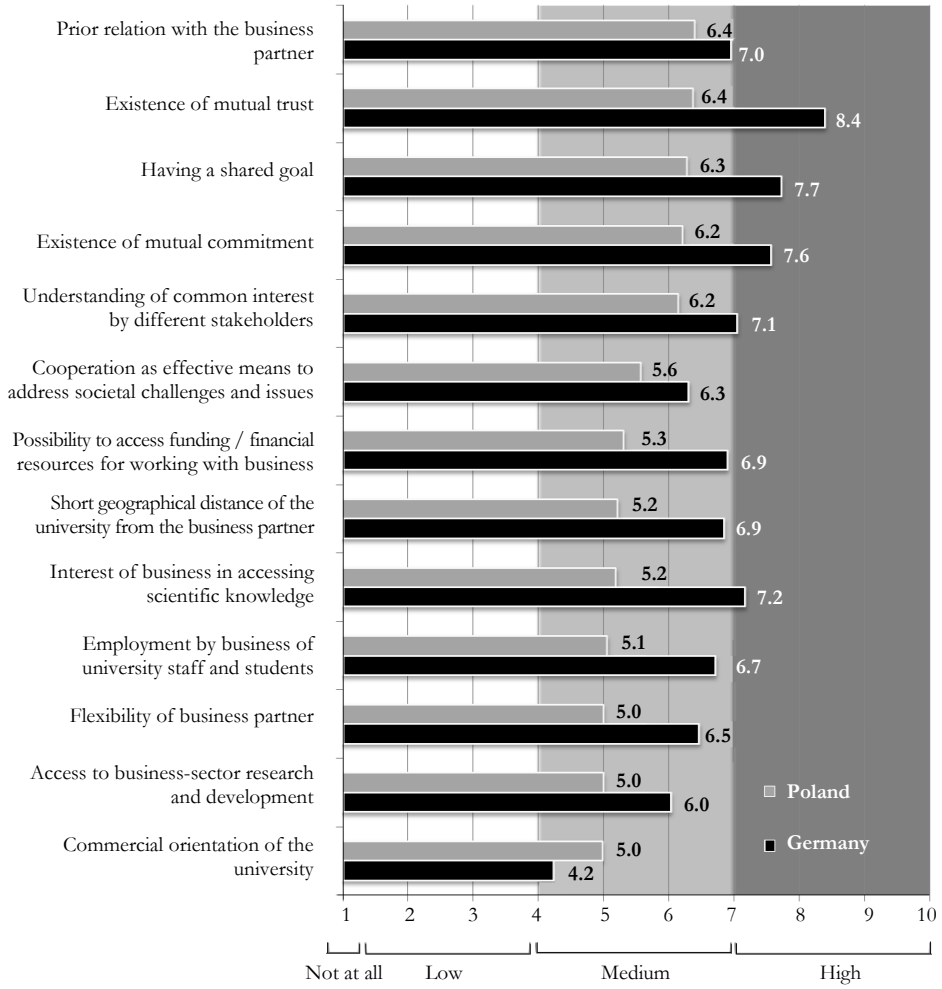


Source: Own elaboration.

4.2.2. UBC Drivers

Drivers are those factors that encourage academics or HEIs to engage in UBC. Drivers of UBC were assessed by both German and Polish university managers and stated as averages.

CHART 3.
UBC drivers perceived by university management in Germany and Poland



Source: Own elaboration.

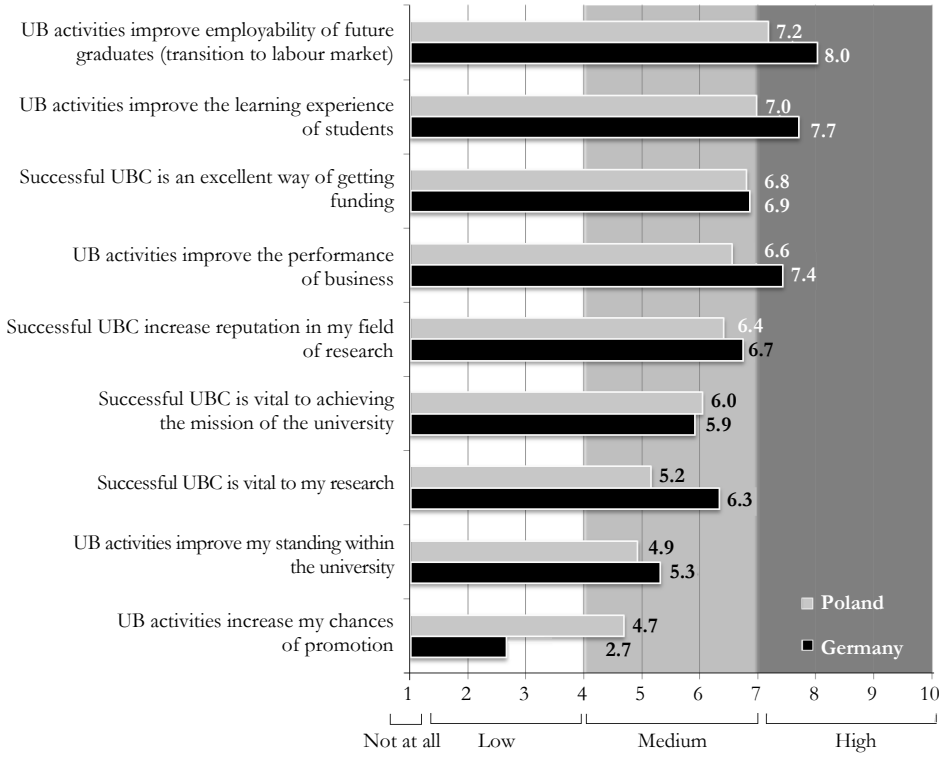
German university management were relatively positive in respect to drivers for UBC with so-called 'relationship drivers' such as 'existence of mutual trust', 'existence of mutual commitment' and 'having a shared goal' being nominated as the biggest drivers.

The drivers for universities to collaborate with business in Poland were not so obvious. With no driver being rated as high, Polish universities management still rated 'relationship drivers' as the biggest drivers, however all drivers except 'commercial orientation of the university' were rated lower than in Germany. Comparatively, Kruskal-Wallis test show how the differences of all drivers analysed are statistically significant.

4.2.3. Perceived UBC benefits

It is the perceived positive outcome (financial and non-financial) from undertaking UBC for the different stakeholders groups that can potentially participate in UBC. This perception can be a reason to increase or decrease their participation or the involvement of other groups. For example, if academics perceive their own benefits to be low, that might cause a low participation in UBC and if they perceive that benefits for students are high, they might undertake actions that contribute to students' involvement in UBC. Results are presented below from both German and Polish academics.

CHART 4.
UBC benefits perceived by academics in Germany and Poland



Source: Own elaboration.

German academics perceived a somewhat positive situation regarding the benefits received from UBC, although the ability of UBC to increase the academics' standing at the university and increase their chance of promotion were related substantially lower. They especially recognised the benefits for students and business for UBC at lesser benefit for the university and themselves.

Rating all UBC benefits lower than their German academic colleagues, except for 'UBC activities increase my chance of promotion', Polish academics perceived much lower benefits from UBC. They too recognised the largest benefits go to students and business followed by the university and finally themselves.

4.3. UBC supporting mechanisms

The UBC supporting mechanisms constitute the 'action-level', where all stakeholders need to focus their efforts when they want to influence the extent of UBC. The specific role and importance of supporting mechanisms at HEIs has long been recognised in both practice and literature supporting both academic and student entrepreneurship [Baldini et al., 2006]. They are often recognised in multiple ways including (i) in a variety of different names (e.g. interventions, enablers), (ii) captured in a model (e.g. ecosystem, regional innovation system) or (iii) known as individual elements (e.g. activities, infrastructure).

4.3.1. Strategies

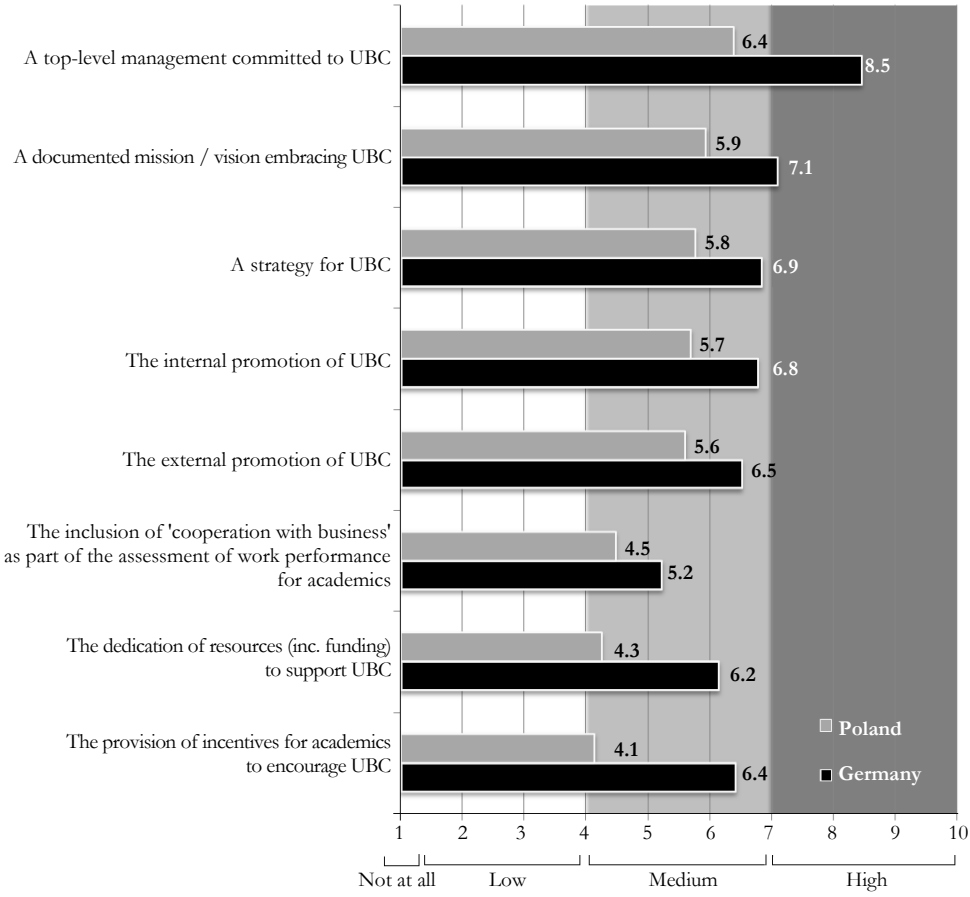
Strategies are the drafting and implementation of cross-functional decisions by a HEI that will enable it to achieve its long-term objectives with respect to UBC. The primary responsibility for the creation of UBC strategies is for HEI management as a strategic instrument is usually created by decisions made at a HEI board level. The following figure highlights the perceived extent of development of UBC strategies in German and Polish universities, assessed by university managers.

In terms of the strategic mechanisms supporting UBC, 'paper' strategies, such as top management commitment and having a mission/vision and UBC strategy, were the most developed strategies. Despite this, there is room for development of 'implementation strategies' in terms of providing incentives and including UBC in the assessment of academics'. Polish university managers also rated 'paper' strategies as the most developed form of UBC strategies.

Comparatively, German university management assessed all mechanisms higher than Polish managers and the Kruskal-Wallis test show that all the differences between them are statistically significant except the inclusion of UBC in academics work performance.

CHART 5.

UBC strategies in Germany and Poland



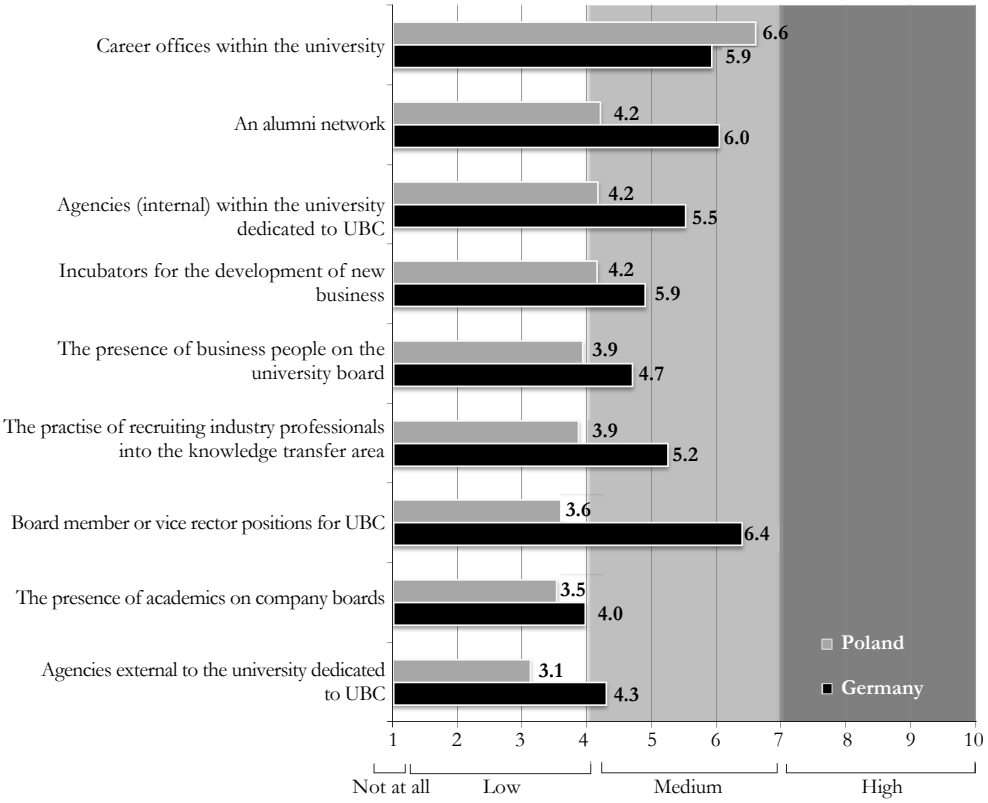
Source: Own elaboration.

4.3.2. Structures

UBC structures are elements created as a result of top-level strategic decisions within (or related to) a HEI that are 'enablers' of UBC and include the creation or development of institutions, positions, methods and policies and programmes. They are put in place in order to promote, develop or implement UBC with a mid to long-term focus and can be created within the HEI or as a bridge between the HEI and business. Structures and approaches usually involve significant investment and can be funded by the HEI, the government, business or a combination of these sources. The following figure depicts the perceived extent of development of UBC structures and approaches in German and Polish universities, assessed by university managers.

CHART 6.

UBC structures in Germany and Poland



Source: Own elaboration.

Board member or vice rector positions for UBC, alumni networks and career offices are the most developed UBC structures in Germany, revealing a focus on those structures related with students. Overall, there is a medium level of development of all structured analysed.

Matching the focus on education-related UBC types, Polish universities have the highest level of development of UBC structures for alumni network and career offices as well; however rate nearly all other structures as low.

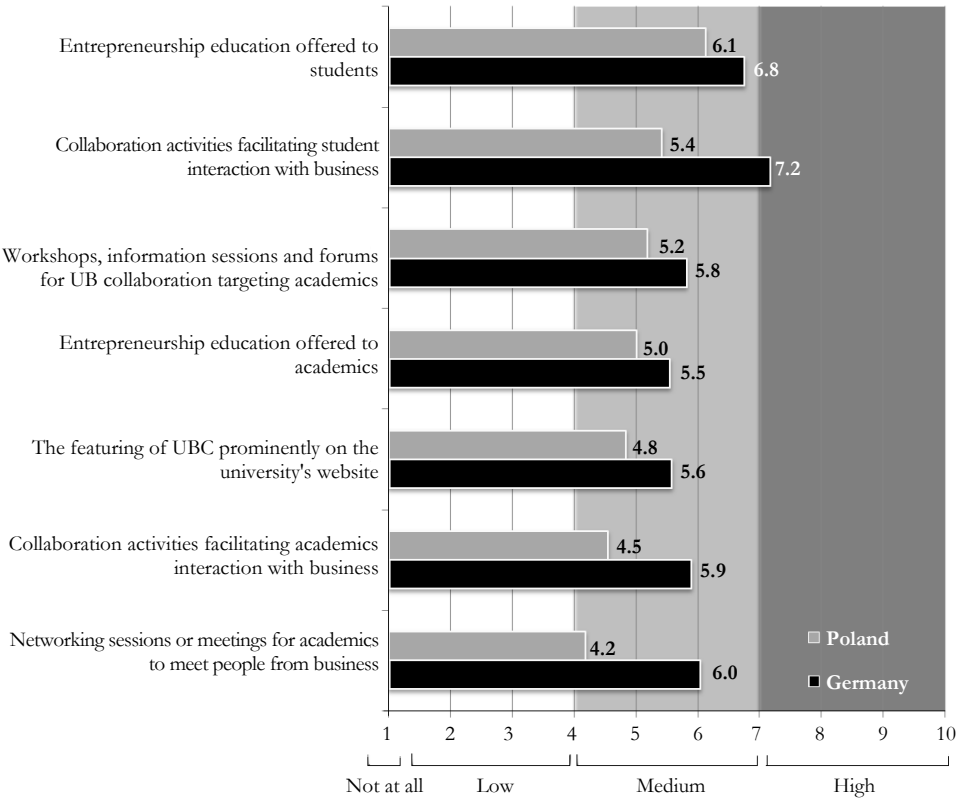
When comparing the results of both countries, the Kruskal-Wallis tests show significant differences for the presence of recruiting industry professionals into the knowledge transfer area, board member or vice-rector positions for UBC, alumni network and agencies (internal and external) dedicated to UBC.

4.3.3. Operational Activities

Operational activities are actions of a practical and immediate nature undertaken by HEIs, governments, regional agencies, HEIs and business to create and support UBC. Operational activities are usually the cheaper to implement of all the supporting mechanisms, require a lower commitment from HEI management and its scope and volume can be measured. The perceived extent of development of UBC activities in Germany and Polish universities, as assessed by university managers, is depicted in the following figures.

CHART 7.

UBC operational activities in Germany and Poland



Source: Own elaboration.

A focus on student-related UBC activities was identified by university managers in Germany, with entrepreneurship activities and activities fostering student's collaboration with business as the most developed activities. Contrary, the least developed ones are related with academics interactions with business. A similar trend can be ob-

served in Poland with student-focussed activities the most developed, whilst the least developed are academic-focussed activities.

Comparatively, German university managers again rate the development of UBC activities higher than Polish managers for all activities presented. However, in this case only four of the items are rated significantly higher from Germany (entrepreneurship education to students, networking sessions or meetings for academics to meet people from business, collaboration activities facilitating academics interactions with business and collaboration activities facilitating students' interactions with business).

5. Discussion and conclusions

Comparatively, the main findings of this paper are the following:

- Poland is generally lagging behind Germany in respect to the development of UBC, although this can be explained largely by the fact that German universities started carrying out UBC activities earlier in time and that the German technical universities and universities of applied sciences generally operate in a very close connection with business.
- Most types of UBC are less developed in Poland than in Germany (all except curriculum development and delivery) and in half of the cases this differences are significant.
- Both countries differ in the approach when interacting with business, since German universities have a focus on research-related UBC, whilst Polish universities have a focus on education-related UBC.
- Polish university managers and academics are negative towards their UBC environment. They rate barriers comparatively higher (especially those regarding funding) and drivers comparatively lower than German university managers. The differences in the reported development of all drivers and most barriers are statistically significant between the two countries.
- Polish university managers and academics do not seem to perceive important reasons for undertaking cooperation with business.
- Both German and Polish academics perceive benefits for students and business higher than for the university and for themselves.
- All UBC supporting mechanisms are more developed in Germany than in Poland, with many differences being statistically significant.
- All UBC strategies are further developed in Germany and in the majority of them these differences are statistically significant.
- All UBC structures (except career offices) are more developed in Germany, some of them with significant differences in development, although both countries focus on those structures related to students.
- UBC operational activities are also more developed in Germany, and again those involving students are in both countries more developed than those involving academics.

Specific UBC recommendations for Poland are derived from previous studies that suggested that universities should adopt context specific strategies, rather than merely imitating developed nations [Bernasconi, 2005; Eun et al., 2006; Davey et al., 2015]. The comparative approach taken in this study should serve for sizing the differences in contexts from both countries and recognize that Poland would not derive optimal results from higher education investments if they merely imitate developed countries. Table I depicts the differences between both countries in resource availability, particularly resources that are detrimental for innovation.

In this respect a context specific understanding of the UBC dynamics, particularly in Poland, would be necessary to develop domestic research capacities that would deliver positive social benefits [Patel, 2003]. For Poland, the results of the extent of UBC development suggest that the engagement form academics with business in education related activities could be a good starting point to initiate and further develop UBC capacities.

Figure 7 shows that the most developed operational activities for UBC in Poland, from the managers' perspective, are education related activities: "entrepreneurship education offered to students (6.1/7.0)" and "collaboration activities facilitating student interaction with business (5.4/7.0)". Previous studies have reported that these first contacts of academics with business for education related purposes have the potential to improve the knowledge and skills [D'Este et al., 2010] and professional networks of academics [Siegel et al., 2007] that could further develop in longer and stronger UBC activities.

Therefore, it is recommended that universities in Poland should pay more attention to this process of collaboration between business and academics for education related purposes, and take a developmental view on this relationship, than to the UBC activities that presses academics and staff from Technology Transfer Offices for research and technology commercialisation.

6. Limitations and further research

While this research contributes to more and extensive knowledge in UBC in Poland and Germany, its results should be briefly interpreted in view of its limitations. Those limitations are mainly based on the sampling methodology.

Firstly, respondents not involved in UBC may have been less willing to answer the questionnaire. The topic is besides their interest and also potentially they would have to admit more negative answers on the questions themselves. A non-response analysis showed that the results are clearly influenced by this.

Secondly, a limited sample size was achieved for the samples due to availability of a contact database, in spite of this, that the final figures are comparatively large. Whereas this is coherent with previous research, in which the requirement of corresponding responses led to small and imbalanced samples suitable for use despite large potential samples at the beginning of the fieldwork [Medlin et al., 2005].

Thirdly, the sample itself was based on the willingness and disposition of first layer target persons to forward it to other potential respondents in the university. In addition,

this could have caused an imbalance due to selection process of those second layer target persons.

Further research could be focussed on how historic events have affected UBC development in both Germany and Poland. Also future research on the different mechanisms in place which are unique to each of the countries could provide better insights as could a discussion on the role of universities of applied sciences and technical universities (polytechnics, universities of technology) as well as the traditional universities in UBC for the sake of the economies of both countries.

Further research also has to consider the business side. The studies so far have not researched the view of businesses and their decision makers. This would be needed to get a full picture of the situation.

What has been seen in this and other studies is also the role of intermediaries (regional development agencies, associations, etc.) and the regional strengths and weaknesses in a country, therefore this could be an option to develop this further.

Finally, in order to explore both countries to a more detailed levels, and due to the fact that each of the two countries have a number of different regions that are characterised by economic, cultural and social differences, a set of regional analyses should be undertaken.

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Paweł GŁODEK, Edward STAWASZ[1]

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SELECTED ASPECTS IN THE CREATION OF THE UNIVERSITY'S KNOWLEDGE TRANSFER CAPACITY

Summary

The paper is devoted to the analysis of the creation of university's potential for knowledge transfer to the business environment. The analysis will be presented in the system inspired by the model proposed by Tidd, Bessant and Pavitt [2005] which is as follows: (i) generating knowledge (ii) searching for and identifying knowledge, (iii) evaluating and selecting ides, (iv) implementing in practice. Each stage creates different challenges for the university's operations (also the final stage, which is not generally carried out by the university), which will be included in the analysis.

The results of the theoretical analysis are referred to the results of the research concerning knowledge transfer practices among universities in Lodz. A total of thirty-five cases of knowledge transfer practices were included in the analysis. The analysis conducted in 2010 and 2011 covered types of practices, the initiative of carrying out practices, their duration, the nature of practices, their subject scope and impact as well as risks and benefits associated with implementing knowledge transfer practices. The preliminary exploration, interviews and innovation studies conducted indicate that the analysis covered a vast majority of such practices, which means that it is representative of the Lodz region.

Key words: universities, innovation process, knowledge transfer.

1. Introduction

The development of the modern economy is largely generated by innovations. New solutions generated by the R&D sector provide strong support for innovativeness of the economy [Drucker, Goldstain, 2007]. Hence, the need for capitalization of expenditure on education at the macroeconomic level, which results, among other things, from trends occurring in the context of the modern economy, is indicated. However, it is pointed out in many areas that knowledge derived from the widely understood sphere of science is not automatically commercialized in the form of new products or services. The enormous complexity of the process of knowledge commercialization in the case of universities is emphasized [Łobacz, Niedzielski, 2015], as well as the complexity of

[1] Pawel Glodek, Ph.D. – Department of Entrepreneurship and Industrial Policy, Faculty of Management, University of Lodz, e-mail: glodek@uni.lodz.pl. Dr hab. Edward Stawasz, prof. UŁ – Department of Entrepreneurship and Industrial Policy, Faculty of Management, University of Lodz, e-mail: stawasz@uni.lodz.pl.

processes of knowledge implementation and its dissemination. This fact hinders detailed understanding of these processes, in particular precise identification of individual "transactions" that show how the process of knowledge transfer occurs and even what the university's potential in this area should be [Etzkowitz et al., 2000].

The university is one of the parties in the process of knowledge transfer. The level of its preparedness to participate in this transfer is one of the factors determining the ultimate success [Hughes, Kitson, 2012]. Hence the aim of this paper is to present factors that determine the creation of the university's potential for knowledge transfer to the business environment. The analytical system inspired by the model proposed by Tidd, Bessant and Pavitt [2005] will be used in the analysis.

The results of the theoretical analysis are referred to the results of research concerning practices of knowledge transfer among universities in Lodz. A total of thirty-five cases of knowledge transfer practices were included in the analysis. The analysis conducted in 2010 and 2011 covered types of practices, the initiative of carrying out practices, their duration, the nature of practices, their subject scope and impact as well as risks and benefits associated with implementing knowledge transfer practices. The preliminary exploration, interviews and innovation studies conducted indicate that the analysis covered a vast majority of such practices, which means that it is representative of the Lodz region.

2. The university in the context of management of innovation processes

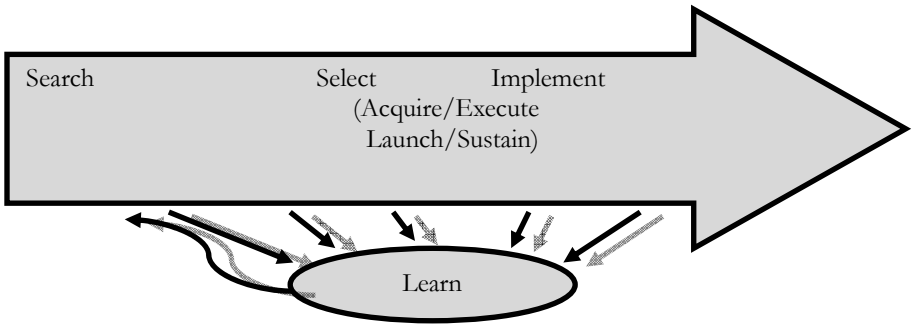
The university is a source of knowledge in the process of knowledge transfer. Its potential to generate solutions of suitable quality, the scope and potential of academic entrepreneurship as well as the potential for cooperation determine to a large extent transfer opportunities [Cieślik, 2014; Matusiak, 2010].

In this context, it should be stressed that ensuring effectiveness of the university's functioning in various types of partnerships with companies requires organizational activities associated with the creation of sufficient quantity and quality of organizational processes within the university. Woźniak [2014] points out in this context the process approach as one of the elements of building the university's competitiveness. The process approach is particularly advisable for management of knowledge within the university. Morawski [2005] indicates a number of factors that interfere with processes of knowledge circulation within the university, among its employees and organizational units. Łobacz and Niedzielski [2015] point to the existence of significant barriers within the university that restrict acquisition of information directly related to commercialization of knowledge.

Tidd, Bessant and Pavitt [2005] emphasize that innovation and the related exchange of information should be an object of management within an organization. It is necessary to introduce rules that allow to support favorable behaviors and attitudes, reduce adverse behaviours, introduce procedures, as well as implement and coordinate the desired processes. Outlining general guidelines for management of innovation processes in the enterprise, Tidd, Bessant and Pavitt [2005] indicate the need for effective implementation of at least three types of activities by innovative entities (Chart 1): (i)

searching for and identifying new ideas (project planning), (ii) evaluating and selecting ideas/projects, (iii) implementing in business practice. It should be emphasized that from the point of view of management, these are interdependent areas – efficient management of each of the areas affects the possibility of achieving favourable results in the remaining ones.

CHART 1.
The general structure of the process of acquisition and commercialization of ideas within an organization



Source: [Tidd, Bessant, Pavitt, 2005].

On the other hand, imperfections in the implementation of one of the stages severely reduce effectiveness of the overall process. In simple terms it can be said that a lack of identification of ideas prevents their evaluation and possible application in practice, even if the organization is well prepared for their implementation. Thus, the stages of the process should be considered as interdependent. A key challenge in managing innovation is to find appropriate methods of carrying out these activities within the given organization (embedding them in structures and processes) to be able to replicate them efficiently and effectively [Bessant, Oberg, Trifilova, 2014; Trzmielak, 2013]. The organization's innovative success also requires the ability to review these procedures, their extension or change – i.e. dynamic capabilities [Teece, Pisano, Shuen, 1997].

Adapting this model to the university's realities, one must take into account its unique specificity, referring in particular to its focus on research and a lack of orientation towards commercial exploitation of research results. Research activity is one of the basic functions of the university and its effect is generating new knowledge. This knowledge, created largely in the context of basic research, should also be subjected to management processes to constitute a basis for its transfer outside. Knowledge management in this context can be understood as a process of identifying, acquiring and multiplying knowledge within an organization in order to improve its competitiveness [Von Krough, 1998]. The objective of knowledge management has, therefore, a very practical dimension relating to the need to support organizational capabilities through better utilization of individual and collective knowledge in the organization. These resources include skills, abilities, experience, routine, standards and technologies [Probst, 1998].

An important factor, which constitutes a significant specific feature of the university, is the fact that its only function is to generate and develop knowledge. The process of commercialization does not occur within the university as a rule. It is the domain of external partners, hence the process of managing innovation processes at the university should take into account processes related to seeking knowledge that can create value for external partners, as well as its actions concerning management of knowledge transfer.

Taking into consideration the above-presented considerations, with respect to innovative processes within the university, four stages will be taken into account: (i) generating/creating ideas, (ii) searching for and identifying ideas (project planning), (iii) evaluating and selecting ideas/projects, (iv) implementing in business practice.

The application of the process approach will allow the analysis and comparison of institutional solutions relating to commercialization of knowledge, including cooperation with companies, used in the framework of universities. Cooperation with companies is taken into account as an important component of the process of knowledge commercialization.

3. The university – institutional solutions and their interconnections

The use of perspective related to the innovation process enables to carry out an analysis of institutional solutions associated with knowledge transfer to the business environment functioning within universities. Various forms of mutual relations between the university and businesses are of key importance in this regard [Lawton, Smith, 2006], therefore, this area of cooperation in particular has been taken into account as an important component of the process of knowledge transfer.

The following elements have been taken into account as the existing institutional solutions in the area related to processes of creating the university's potential of knowledge transfer to the environment: (i) dean's representative for business relations, (ii) university chancellor's representative for business relations, (iii) innovation broker , (iv) creation of publicly available databases, (v) university technology transfer center, (vi) academic technology incubator, (vii) a university network of knowledge scouts. Specific solutions have been evaluated in terms of their effectiveness in the area of requirements generated by the subsequent stages of the innovation process carried out at the university. A four-level scale assessing effectiveness of the solution has been used: "lack of application of the given solution at the particular stage", "poor effectiveness of the given solution", "moderate effectiveness of the given solution" or "high effectiveness of the given solution".

Table 1 presents a simplified assessment of effectiveness of the use of individual instruments in the process of creating the supply of knowledge endowed with the commercial potential. This process is a component of innovation processes within the university and is understood as a sequence of actions aimed at building the university's offer, containing specific proposals for cooperation with businesses (and more broadly – with the environment), or at commercialization in the form of spin-off companies. The

table shows a distribution of areas of activity in terms of individual entities at various stages of the innovation process. Entities that carry out simultaneously activities included in the subsequent stages of the process can be seen, however, each of these entities has solutions of main importance. Activities of the university network of scouts are largely focused on the stage associated with the search for new knowledge. In terms of its evaluation and selection, the technology transfer center dominates and in terms of commercialization of knowledge the technology transfer center along with the innovation broker play a dominant role. The final stage, referring to actions of the entities established in the framework of the commercialization process, is an area dominated by academic technology incubators.

TABLE 1.

The importance of academic units in the process of creating new ventures for commercialization of knowledge

Academic unit	Search for new knowledge at the university	Evaluation and selection	Implementation of knowledge and its commercialization	After transfer
Dean's representative for business relations	+	+	–	+
University chancellor's representative for business relations	–	–	–	–
Innovation broker	+	++	+++	–
Publicly available university databases	+	–	–	–
University technology transfer center	+	+++	+++	+
Academic technology incubator			+	+++
University network of knowledge scouts	+++	++	+	–

Comment: Description: "–" lack of application of the given solution at the particular stage, "+" poor effectiveness of the given solution, "++" moderate effectiveness of the given solution, "+++" high effectiveness of the given solution

Source: [Wiśniewska, Głodek, Trzmielak, 2015]

Table 2 contains a simplified assessment of effectiveness of the use of individual instruments in the process of creating demand for knowledge endowed with the commercial potential originating from the university. This process is understood as a sequence of actions aimed at a search for partners interested in various forms of cooperation drawing on knowledge derived from the university. As shown in Table 1, the distribution of areas of activity in terms of the respective units at different

stages of the innovation process can be seen. In this case, the activity of the university network of scouts is largely focused on the stage associated with a search for new partners in the process of knowledge commercialization. This also includes an area realized by other entities, although in a relatively ineffective way.

TABLE 2.

The importance of academic units in the process of seeking external partners for ventures of knowledge commercialization

Academic unit	Search for areas of cooperation among potential partners	Evaluation and selection of ideas	Support in the negotiation process	After establishing cooperation
Dean's representative for business relations	+	+	–	+
University chancellor's representative for business relations	+	+	–	–
Innovation broker	+	++	++	–
Publicly available university databases	+	–	–	–
University technology transfer center	+	+	+++	++
Academic technology incubator	–	–	–	+
University network of knowledge scouts	+++	++	+	–

Comment: Description: "–" lack of application of the given solution at the particular stage, "+" poor effectiveness of the given solution, "++" moderate effectiveness of the given solution, "+++" high effectiveness of the given solution

Source: [Wiśniewska, Głodek, Trzmielak, 2015].

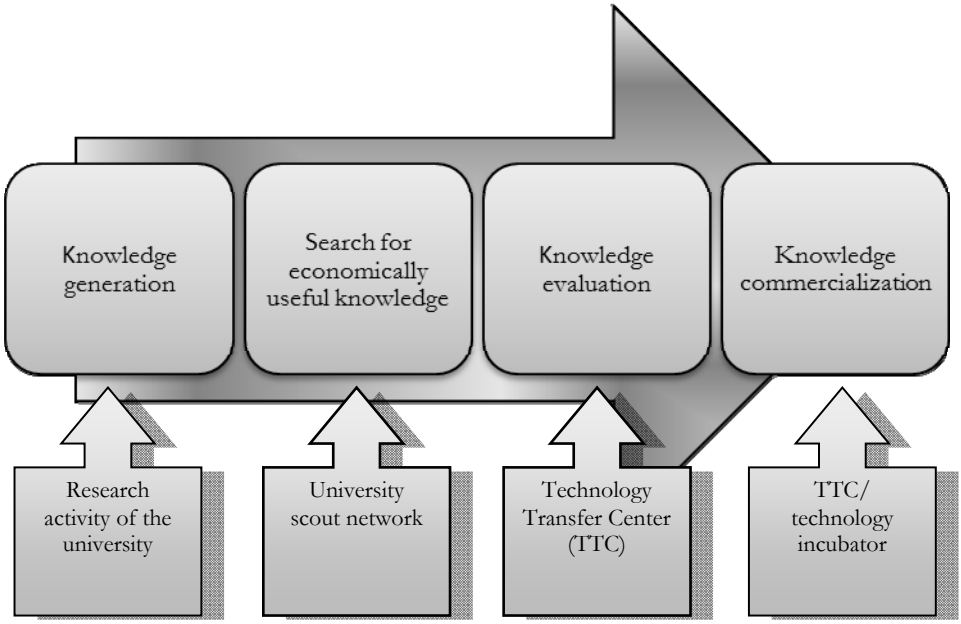
Focusing on key institutions at different stages of the innovation process carried out by the university, the model of managing this process can be supplemented with new elements. Figure 2 shows the main actors in the system of stages of this process indicated above:

1. "Generating knowledge" stage – researchers, research teams, faculties and departments,
2. "Search for economically useful knowledge" stage – the university network of scouts,
3. "Evaluation of acquired knowledge" stage – the technology transfer center,

4. "Implementation/commercialization of knowledge" stage – the technology transfer center, and in the cases of commercialization through the establishment of new companies also academic technology incubators.

CHART 2.

Key activities/institutions in the simplified model of managing the innovation process at the university



Source: [Wiśniewska, Głodek, Trzmielak, 2015].

4. Transfer of knowledge in the universities-companies system in the region

The basis of innovation is applicable knowledge (innovative ideas). Its acquisition is a prerequisite for implementation of innovation in an enterprise. Sources of innovation can be divided into internal ones (the entity's own sources), external ones (derived from the entity's environment) and mixed ones [Bogdanienko, 2004; Łącka, 2011]. Internal sources include solutions produced within the company and ingenuity of its employees. In the case of an innovative company, its main advantage is the exclusivity of its solutions, while high uncertainty of desired effects, long lead times and high costs are disadvantages. External sources include solutions generated outside the company, licenses, acquisitions, joint venture companies. External technical knowledge is the easiest method to obtain new solutions, effective and less risky, although it can cause dependence on technology suppliers.

Transfer of external solutions can be described as providing the market with technologies [Jasiński, 2006]. It is a special case of a communication process. This is often an interactive process in which various feedback loops between providers and recipients of knowledge occur [Santarek, Bagiński, Buczacki, Sobczyk, Szerenos, 2008]. It covers all types of diffusion of solutions and technical education. Knowledge transfer is the transfer of the information necessary for one entity to be able to replicate the work of another entity. This information exists in two forms: technical information (engineering and scientific knowledge, standards) and procedures (including legal procedures, confidentiality agreements, patents, licenses). It is usually a market process in which technology is bought and sold. Transfer of knowledge is therefore the transfer of specific technical or organizational knowledge and related know-how for economic (commercial) purposes.

Transfer of knowledge can be differentiated into commercial and non-commercial one [Grimpe, Fier, 2010]. Non-commercial transfer includes: (1) knowledge transferred free of charge, studies, internships, etc., (2) professional associations, (3) mutual transfer of licenses, (4) knowledge transferred within companies, for example, multinationals. Commercial transfer of knowledge involves transfer of knowledge and technology between entities unrelated structurally and covers: (1) material transfer (hard), (2) trading licenses for inventions, utility models and know-how, (3) broadly understood information, including the so-called tacit knowledge.

Transfer of knowledge takes place mainly between the science and research sector and the sphere of economic activity, creating a unique bridge between these two worlds and bringing both parties many economic market, organizational, educational benefits, etc. The partners in the process of knowledge flow in different systems comprise: scientific and research institutions, large, medium and small enterprises, public institutions and individuals. A characteristic feature of cooperation between the sector of science (universities) and businesses is the presence of many cultural and organizational differences in these two spheres (different motivations, goals and methods of conducting activities, criteria for work evaluation, etc.). This creates many difficulties for the establishment and continuation of effective cooperation in the field of knowledge flow [Hewitt-Dundas, 2012].

Transfer of knowledge from the public science and research sector to companies is done through a number of channels and organizational forms [D'Este, Patel, 2007; Matusiak, 2010; Trzmielak, 2013]:

- joint research and targeted projects implemented in cooperation with businesses;
- contract research commissioned by companies;
- providing licenses for different forms of intellectual property, know-how;
- consulting, opinions, expert opinions, reviews, science and technology intermediation;
- flow of technical personnel, trainings;
- spin-off companies;
- scientific publications, popular science publications, patents;
- conferences, seminars, fairs; courses and trainings;

- informal contacts between scientists;
- personnel mobility programs, (exchange/transition of employees from the science sector to the business sector and vice versa), student internships;
- information about new technologies, initiating the transfer;
- support for innovative ventures of small and medium-sized enterprises;
- initiating collaboration and cooperation networks;
- the development of the support system for innovative ventures and entrepreneurship.

A regional innovation policy plays an important role in transfer of knowledge from the public R&D sector, including universities, to businesses [Matusiak, 2010]. In functional terms, it is a unique forum for cooperation between different types of organizations and institutions operating in the region, whose principal purpose (or one of the objectives) is the development of innovative entrepreneurship in the region. These units include: regional authorities (voivodeship, county and municipal level), regional development agencies, universities, R&D institutes, innovation centers, financial institutions, consulting, manufacturing and services companies, etc. In the framework of the regional structure, a kind of functional network connecting all entities operating in the field of innovation and technology transfer is created. A regional innovation policy is characterized by the focus on the demand aspect of innovation that requires interaction between companies, especially SMEs, and the sphere of research, science and technology. This is due to the proximity and greater confidence in the partners coming from the same area, professing the same values determined by the same cultural factors [Jewtuchowicz, 2005; Nowakowska, 2010; Shane, 2005; Hewitt-Dundas, 2012]. Services for transfer of knowledge and innovation in the universities-local businesses system are provided mainly by regional institutions of the innovative business environment, as well as commercial providers, operating in the broadly understood area of entrepreneurship, innovation, technology transfer and commercialization. The status and development prospects of this sphere of economy, as well as the quality and range of services provided, have an increasingly visible impact on knowledge flows and innovativeness of individual companies and on the overall economy [Stawasz, 2009].

5. Transfer of knowledge in the universities – businesses system in the Lodz region[2]

Types of knowledge transfer

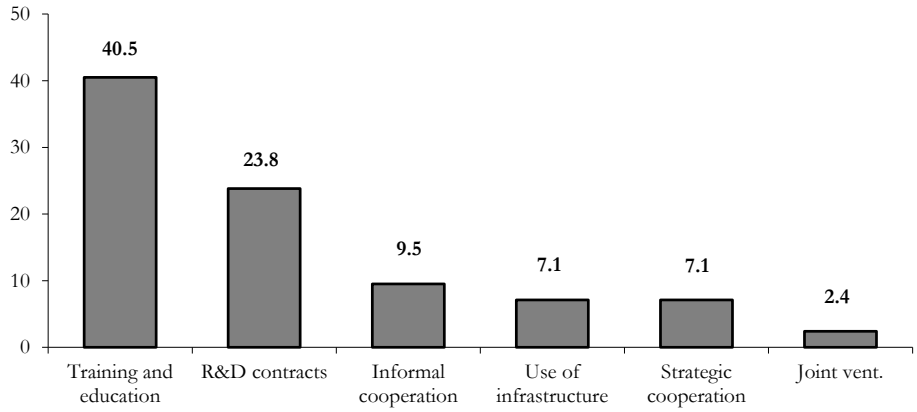
Knowledge transfer practices between universities and businesses can be divided into seven types (Chart 3). Simple, not highly developed practices dominate. Practices in

[2] The paper uses the results of the empirical research conducted in 2010-11 within the framework of the international project "Innovation Policy in University City Regions – INNOPOLIS" (Program INTERREG IVC) implemented with the participation of authors derived from universities in Lodz (the University of Lodz, Lodz University of Technology and the Medical University of Lodz). For the analysis included a total of thirty-five cases of practices of knowledge transfer. Conducted reconnaissance as well as interviews and existing reports, indicates that the analysis covered the important part of such practices.

the framework of cooperation in the field of training and education addressed to students, university and company employees, as well as other individuals are predominant (40.5% of the cases). Transfer of knowledge between universities and businesses occurring in the framework of contracts, mostly research ones (23.8%), as well as in the framework of informal cooperation which covers practices that take place without the consent of both parties (9.5%) plays an important role. Informal cooperation usually applies to the use of research results and research infrastructure free of charge and without the university's consent, as well as trainings conducted on the premises of the university.

CHART 3.

Key activities/institutions in the simplified model of managing the innovation process at the university



Source: author's own work.

Other types of knowledge transfer between universities and businesses occur much less frequently. Transfer of knowledge in the framework of the use of infrastructure (7.1% of the cases) as well as in the framework of strategic cooperation between universities and businesses (only three cases – 7.1%) can be mentioned. In just one case, there was an exchange of knowledge between universities and businesses in the framework of joint venture, considered a very advanced form of knowledge transfer.

The initiative of knowledge transfer

Knowledge transfer practices between universities and businesses in the Lodz region were initiated from the top in the context of the policy to encourage innovation in the region, either by universities or by companies themselves. The analysis of the forms of initiating practices of knowledge transfer between universities and businesses in the Lodz region shows that they are initiated primarily by universities (67.6% of the cases), mainly within the framework of various types of programs of cooperation with the regional economy. Every sixth case (18.9%) resulted from the initiative on the part

of companies, every seventh case was initiated within the framework of programs to support innovation in the region (13.5%). Among the seven cases initiated by companies, there are four cases conducted in the framework of cooperation based on a contractual (research) agreement and three cases arising from informal cooperation. However, among the five cases initiated by innovation support programs, there are four cases implemented under research contracts and one case involving trainings and education.

The duration of knowledge transfer practices

Knowledge transfer practices between universities and businesses in the Lodz region were analyzed in terms of their duration and reproducibility (in other circumstances and institutions). In terms of the issue of duration of the practices, they are divided into two groups: long-term (with a duration of more than 6 months) and short-term (less than 6 months). The analysis conducted shows that short-term practices are dominant – 4/5 of the total number of cases. Long-term practices, hence the most useful for knowledge transfer, constitute only 1/5 of the total number of cases. All of these cases concerned transfer of knowledge between universities and businesses carried out in the framework of contracts or long-term strategic cooperation.

More than 4/5 of all the cases (82.6%) are reproducible, which means that they can be used in other circumstances and by other entities. They can be, therefore, disseminated in the Lodz region as the so called "good practices". Only 17.4% of the cases were irreproducible, difficult to disseminate. This concerned mainly cases of knowledge transfer between universities and businesses in the framework of informal cooperation.

The scope of knowledge transfer

In the case of the subjective scope of knowledge transfer practices between universities and businesses, the analysis has highlighted two kinds of scope, i.e. direct cooperation between the two parties and cooperation with the participation of a third party, e.g.: government offices, other stakeholders. The cooperation in the framework of which only transfer of knowledge between universities and businesses occurs is dominant (77.1% of the cases). A larger number of participants can only be found in 22.9% of the cases. Half of the cases involved activities carried out under contracts.

Effects of knowledge transfer impact

Regarding effects of the analyzed practices of knowledge transfer between universities and businesses in the region, direct effects in the form of flow of knowledge and indirect effects associated with initiating the flow of knowledge can be distinguished. The conducted analysis of knowledge transfer practices between universities and businesses in the region indicates that indirect effects dominate (62.9% of the cases). Direct transfer of knowledge took place only in slightly more than 1/3 of the cases. This indicates weakness of knowledge transfer between universities and businesses in the region. Only every third case of cooperation yielded a direct flow of knowledge. These cases involve cooperation in the framework of contracts, informal cooperation and

strategic cooperation, and thus long-term projects. The remaining 2/3 are the cases concerning a potential flow of knowledge –the initiation of this process.

Risks and benefits of knowledge transfer

The analysis indicates that knowledge transfer practices between universities and businesses in the Lodz region are associated with a small risk of failure – this applies to 70% of the analyzed practices in the case in which no or minimal risk of failure exists. Only 30% of the analyzed practices were affected by the risk of failure considered as medium. A noticeable risk of failure takes place mainly in the following cases:

- cooperation undertaken with the participation of a third party, e.g. business support institutions, technology transfer institutions, government agencies (80% of the practices of this type),
- cooperation initiated within the top-down (formal) approach in which both parties, i.e. the university and the company, are somehow "compelled" to cooperate in the exchange of knowledge (60% of the cases),
- cooperation carried out in the framework of research contracts generally burdened with a great risk of failure.

Transfer of knowledge between universities and businesses allowed both parties, i.e. universities and businesses, to obtain a number of scientific and research, educational, economic, organizational and market benefits. Relatively more benefits were obtained by companies (97%) than universities (88%).

Both parties have indicated different types of benefits derived from knowledge transfer:

1. In the case of companies, the following benefits are primarily derived:
    a. scientific and research benefits related to obtaining new or improved knowledge by the company (43% of the companies); it should be noted that the acquired knowledge in most cases has been applied in practice (60% of this type of companies), which is the evidence of high practical value of knowledge transfer;
    b. organizational benefits related to skills of personnel and the improvement of operational strategy (34% of the companies);
    c. economic benefits related to the improvement of economic performance, e.g. reduced production costs, payments for services rendered (23% of the companies);
    d. market benefits related to commercialization of knowledge and the improvement of the company's market position (6% of the companies).
2. In the case of universities, the following benefits are primarily derived:
    a. economic benefits, e.g. payments for services rendered (43% of the universities);
    b. educational benefits, mainly related to the possibility of organizing internships for students in companies (43% of the universities);

c. scientific and research benefits related to the development of knowledge in cooperation with companies, e.g. testing and laboratory research of technologies in companies (20% of the universities);
d. organizational benefits related to the development of scientific staff (9% of the universities);
e. market benefits related to commercialization of knowledge created at universities (6% of the universities).

The above-presented review of benefits obtained as a result of knowledge transfer indicates that both parties receive benefits. Universities, however, tend to point to economic and educational benefits, whereas companies mention scientific and research benefits as well as organizational ones.

6. Conclusions

The paper provides an analysis of the process of creating the university's potential in terms of its ability to transfer knowledge to the business environment. A relationship between processes of knowledge generation as well as innovation processes and the institutional system operating within the university has been shown. The understanding of this system is important due to the significant interdependence of individual stages of the process in terms of ability to generate results in the form of knowledge transfer.

The paper uses the results of the study of knowledge transfer practices among three largest universities in Lodz. The study indicated primarily the use of simple, not highly developed practices. In particular, such practices that do not require significant changes in the operation of the university's individual organizational units. Strategic, long-term cooperation is very rarely encountered and short-term cooperation, not exceeding six months, prevails. This fact can be associated with the perception on the part of companies of the relationship with the university in the context of heightened risk [Poznańska et al., 2012], which may limit their tendency to deeper commitment to cooperation.

Implemented practices are most often reproducible, which means that they can be used in other contexts and by other entities. They can thus be disseminated in the region of Lodz as the so called "good practices". Cooperation in the framework of which only transfer of knowledge between universities and businesses occurs is dominant. Effects of these practices are mostly indirect, providing only the initiation of the process of knowledge transfer.

The review of benefits derived from transfer of knowledge indicates that both parties obtain benefits. Universities tend to point to economic and educational benefits, whereas companies indicate scientific and research as well as organizational benefits.

The overall structure of universities-businesses cooperation indicates a certain weakness of knowledge transfer between the partners in the Lodz region. In practical terms, the identified transfer profile shows the need to strengthen internal processes preparing universities in the region for transfer of knowledge. This strengthening, relating to internal structures, should aim at increasing the university's potential to create stable, long-term and strategic relationships with partners in the economic environment.

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Andrzej H. JASIŃSKI[1]

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UNIVERSITY OF WARSAW ON ITS ROAD TOWARDS THE MODEL OF ENTREPRENEURIAL UNIVERSITY

Summary

In this paper we deal with the idea of an entrepreneurial university in Polish conditions with a special reference to the University of Warsaw, the biggest university in Poland. We try to prove that the signpost on the road towards such model of a university is a proper strategy of research cooperation between the University and the economic environment, especially with the business sector. We argue that the strategy should be based on a marketing approach. However, there is still a long road ahead of the University of Warsaw towards the model of entrepreneurial university.

Key words: entrepreneurial university, research cooperation, University of Warsaw

1. Introduction

The main aim of this paper is an attempt to answer the following question: What should be done so that University of Warsaw can become an entrepreneurial university? The answer seems quite simple: The signpost on the road towards such model of a university is the strategy for a significant broadening, differentiating and improving of research cooperation between the University and its economic environment.

The university environment is a very broad concept. Here we have in mind an economic or business environment. We shall also use the business sector as an equivalent in a broader meaning, i.e. including health service, urban transportation, schools and other educational institutions, public administration, local governments, etc.

The paper is based on the fragments of the latest report [*Założenia do strategii współpracy badawczej*…, 2015], unpublished. For the purpose of that project, we have adopted a marketing approach to research and development (R&D). In marketing, as known, the whole thinking starts somehow from the end, from the market, i.e. from recognition of social needs that appear as demand just in the market. So, the market drives an enterprise, institution or another organization functioning according to the marketing orientation.

[1] Prof. dr hab. Andrzej H. Jasiński – School of Management, University of Warsaw, e-mail: ahj@onet.pl.

Such approach seems fully reasonable in the case of university research that forms a market activity, too. The more so that commercialization of R&D results and cooperation with the business sector – as two key features of an entrepreneurial university – have their roots going as deeply as to the phase of research initiation or even to ideas of new products, processes or services that should heed some social needs.

2. An entrepreneurial university in the market

The concept of entrepreneurial university was used for the first time by Clark in 1998 and then popularized by Etzkowitz [2002]. According to the latter, a modern, entrepreneurial university is no longer an ivory tower but a global economic engine [Etzkowitz, 2014, p. 6].

For Clark [1998], one of five fundamental features of such university is a diversification of financial sources. This diversification means that – apart from budget grants and student tuitions – the third stream of financing (third-party funding) is being searched – expected from the business sector, local governments and alumni; and also from intellectual property rights' (IPRs) protection and services offered by a university campus [Leja, 2013, p. 67].

An entrepreneurial university is the managerial construct of driving the university. According to Pluta-Olearnik *et al* [2009, p. 7], a modern, entrepreneurial university is a multi-dimension institution operating in numerous fields, looking for new chances and actively creating its future. Also, this is an institution characterized by flexibility in adjusting to changing conditions of the market of education and research and permanently seeking competitive advantages – see also [Popławski *et al*, 2013, pp. 30, 35 and 185].

The idea of entrepreneurial university was brought into the Polish literature by Jabłecka in 2002. While analyzing world experiences in the mid-20th century, she describes four coordination models of the system of higher education and academic research. One of them is the model of market coordination that assumes university's independence in goods' exchange with its environment. Individual academic employees or higher-education institutions (HEIs) provide teaching and research services to the environment and in return they receive resources for their activities [Jabłecka, 2002, pp. 25 and 188-205]. It was just the market model of coordination that was a kind of base for the appearing of the concept of entrepreneurial university.

According to Leja [2013, p. 57], Polish universities have overcome subsequent phases of transformation. The first stage – a growing number of students – has been already completed; the second one – an improvement in public finance efficiency – is now underway, and the final one – a partnership with the enterprise sector – is ahead of us. Leja notes that there are three regulators of a modern university existence: legal regulations, the market of services offered by a university and a growing social pressure [ibidem, pp. 191-192]. Here we are mainly interested in the second regulator.

Pluta-Olearnik *et al* [2009, pp. 23-25] formulates and analyzes four orientations of an entrepreneurial university. This is a kind of reference to the four coordination

models. One of them is a market orientation that is fulfilled when the university shows five features, among them: (i) while running research projects the university cooperates with the business sector, and (ii) very well knows and monitors a competitive environment.

According to these authors, since a university is a subject in multi-sided market relations, it requires a good organization of marketing activities. 'Time has come for a university's professional marketing' [Pluta-Olearnik *et al*, 2009, p. 57]. University as a market participant must effectively react to changing environment conditions.

All cited authors very critically evaluate the state of entrepreneurship in Polish universities. Also Gorzelak [2009] and Popławski *et al* [2013] are full of criticism of this issue. As it results from the previous report [Jasiński, 2014], there exists a big gap between the R&D potential of University of Warsaw and the scale of its research cooperation with the business sector. Leja [2013, p. 259], referring to Hamel and Prahalad [1999], writes in this context about a gap between university's aspirations and resources.

University is a subject that produces knowledge[2] and so has a duty to share it with (a) students as an internal world, and (b) an environment as an external world. Of course, this sharing takes place then when there happens a knowledge transfer from a university to outside, usually accompanied by a transfer of intellectual property rights. However, we must remember that, nowadays, a capacity to generate a new knowledge becomes less important than an ability to sell it – or buy – and to use it efficiently [Tidd, Bessant, 2009, p. 717].

We understand this as follows: it should be a double-sided knowledge transfer, in other words, a permanent exchange of knowledge should occur between a university and its environment – with benefits to both sides. This also confirms the validity of a broader approach to commercialization of R&D results and of research cooperation with the business sector.

Of course, the knowledge being made available to the economic environment should:

- be a source of incomes for a university and its employees,
- be legally protected; here we mean the intellectual property rights' protection, and
- have a certain value for its user. This user can be, for example, a student, an academic teacher or researcher, an economic entity, a local government, etc.

Admittedly, a university is not a firm but let us look at it as a modern institution which operates in the business surroundings. Then a relevant subsequence of questions, being asked 'from the end' while creating a university research offer for the economic environment, should be as follows:

1. what does the environment expect from us?
2. do we offer exactly what is expected from us?

[2] Breznitz [2014] even notes that the main role of university is to be a fountain of knowledge in its region.

3. (if not exactly) what should we offer?
4. what should be an object of commercialization?
5. so, what research initiatives should we undertake?

There is an opposite mechanism, too: How to sell what we have already done, in other words, possessed results of research? This is also an equally important problem and here marketing will be helpful, too. So then, we first must know what we possess, what value we can offer, what knowledge we can/want to share.

Commercialization of the results of R&D work is, to some extent, a symptom of university's cooperation with the business sector because their practical implementation usually takes place in an enterprise (the existing or a new one) in order to launch a new product, process or service into the market afterwards. Also, it is in the university interest to investigate vicissitudes of life of academic research results. We must remember, of course, that University of Warsaw is not a university of technology (polytechnic) where the range of cooperation with the business sector is, in the nature of things, more broader.

To sum up, the recommended marketing approach to the management of research activities in an entrepreneurial university can be presented as follows[3]:

Commercialization ← Knowledge transfer ← Research project ← Research initiative

This is a recommended subsequence of thinking. However, the marketing approach requires starting from an analysis of the business sector needs.

3. A market of research projects/services

The main element of university surroundings is the market environment. A university operates in:

- the service market (education, research, expert analysis, advisory, training),
- the commodity market – in a narrow range; we here mean the science infrastructure,
- the public funds market (funds for education and R&D), and
- the labour market.

The first market, i.e. services, can be conventionally divided into education and R&D. Here we are especially interested in the market of research services/projects. This is, at the same time, an institutional market (B-to-B) in which the consumers do not participate. So, there is a double specificity of the market we deal with in this paper.

As known, each market has two sides: (1) supply and (2) demand. In the subjective depiction, **the supply side** consists of those who offer/perform research services/ projects. Among them there are competitors. Next, **the demand side** consists of recipients/users of R&D work. Here we have three basic groups/types of entities: 1) enterprises, both private and public, 2) institutions, both public and private,

[3] This must be read from left to right

including self-governments and 3) other non-profit organizations, mainly non-governmental organizations (NGOs). Pluta-Olearnik *et al* [2009, p. 83] comes up to this in a different way, dividing a university environment into three (macro) segments: alumni, a competitive environment and an economic practice which are further developed by her into six groups of entities.

In the objective depiction, an R&D project/service should be treated as an object of:

- an offer of research services/projects,
- research cooperation with other economic entities, and
- competition, mainly with research institutions.

This is **the supply side**. Then, **demands** for R&D projects/services are being submitted by numerous and various economic entities. However, we should not treat them as typical clients. They ought to be treated rather as participants in research processes and actually as partners in a long-term cooperation or even broader as our stakeholders. From the point of view of a university, the stakeholders are, for example, employers employing our alumni and also alumni per se who should be treated as a kind of liaison officers between their university and the business sector. In the case of a university, the stakeholders are, of course, public institutions and citizens, including local communities.

The growing role of stakeholders in the environment of a modern university is underlined, e.g. by Leja [2013, p. 72] and Poplawski *et al* [2013, p. 32]. The environment expects from a university a new, useful knowledge which is or should be created with participation of broader and broader groups of stakeholders. They fulfill a double role: they are not only recipients of the services but also co-creators of the offers. This lies in a university interest, of course, to fulfill their expectations which requires establishing relations with them, admittedly, goals of various groups of stakeholders may sometimes be contradictory to each other [Leja, 2013, pp. 155, 190, 204].

Basic forms/ways of research cooperation with the university economic environment are as follows:

1. contract research ordered by firms and other economic entities,
2. joint research projects together with economic entities,
3. creating and participating in research consortia,
4. commercialization of own research conducted in a university,
5. cooperation with institutions announcing public procurements in R&D services,
6. expert analyses, advisory and trainings for enterprises and other entities.

So, a university – as a scientific and research institution – should know how and where to seek:

- customers for research and expert analyses – this is the main category of recipients in the university economic environment,
- partners into consortia applying for research projects, domestic and foreign. Besides firms, such partners will be research institutions some of which may be competitors in everyday life (this is a so-called coopetition),
- entities interested in implementation and commercialization of results of a university own research,

– institutions announcing public procurements.

Thus, considering a university research offer addressed to entities belonging to its surroundings, one should speak not about a sales offer but rather about a cooperation offer.

A general picture of universities' cooperation with the business environment in Poland is shown in empirical studies by Pluta-Olearnik *et al* [2009, p. 105]. Here we shall quote only opinions among representatives of enterprises[4], because – in the marketing approach – their point of view is more important than the view-point of representatives of research institutions. Some of the results are as follows:

– the bigger the firm, the bigger the interest is in cooperation with universities,
– the hitherto cooperation initiatives were more often initiated by business representatives than by scientists,
– enterprises in a narrow range use the knowledge potential of university employees, because as much as 56% of managers did not order any research from universities,
– the most often mentioned forms of cooperation between business and science are: receiving students for practical trainings and attendance in university open trainings which refers mainly to smaller firms and
– the main barriers for the cooperation, viewed by the managers, are connected with: a lack of broader information about possibilities for such cooperation, a lack of collaboration offer from the side of universities (sic!) and an excessively theoretic approach by scientific workers to problems in an economic practice.

In turn, Leja [2013, p. 163] mentions the following results of barriers in university-environment relations: a small influence of the economic environment on university activities, too small share of the business sector in financing university R&D and ineffective, wrongly directed strategies of Polish universities.

So, the present state of this cooperation is highly unsatisfying, especially a passive attitude of universities. This proves a lack of the marketing approach on the side of academic institutions. Therefore, the research service/project market is not sufficiently developed.

In the spatial depiction, University of Warsaw operates in local, regional, national and European markets. We are naturally interested in a regional market that is the Mazovia voivodship/region which has some specific features due to the fact that a capital city is here. However, the range of the Warsaw University's influence is much broader.

4. The present state of affairs

University of Warsaw is '2 in 1' because it consists of two visible, integrated parts: A – is a kind of natural sciences university, B – is a humanistic university (see the table below). The following conclusions – general but a bit simplified – result from it:

[4] Managers of 125 firms in the Lower-Silesia voivodship have been interviewed.

1. University of Warsaw is a humanistic and natural sciences university,
2. a research potential in social and humanistic sciences (let's call them soft) is three times bigger than in natural sciences (called hard),
3. research in 'hard' sciences have a bigger importance/weight: a domination of basic research, a higher cost-intensive R&D work, etc.,
4. research results in 'soft' sciences are more easier for practical applications, and
5. in social and humanistic sciences are bigger wideness and diversification of their offer that, apart from research, may contain expert analyses, advisory and training services.

TABLE 1.

University „2 in 1"

	Part A (Natural Sciences)	**Part B (Humanistic)**
Affiliation to sciences	Natural, technical and medical	Social and humanistic
Number of academic teachers (in 2013)	852 = 26,8%	2.327 = 73,2%
Dominant type of R&D work	Basic and applied research	Applied research and development work
So-called closeness to the market	'Further from the market'	'Closer to the market'
Degree of materialization of R&D results[1)]	Bigger	Smaller
Cost-intensiveness of R&D	Higher	Lower
Nature of sciences	'Hard'	'Soft'
Role of IPRs	Much bigger	Much smaller
Wideness and diversification of a research offer	Smaller ones	Bigger ones

[1)] a routine result of a research project usually is a research report

Source: [*Założenia do strategii współpracy badawczej*…, 2015, p. 25].

The following, selected observations result from the study done last year [Jasiński, 2014, p. 29]:

- University of Warsaw has a 'research layer cake' big enough to be a potentially attractive, broad and highly differentiated offer for its environment, especially economic,
- from a view-point of the University cooperation with the business sector, too small are the scale and share of research close to the market: contract research is a margin of the University of Warsaw research activities,
- alarming is the situation in patenting, technology transfer and commercialization of research results obtained in the University, and
- there are some weakly exploited sources of incomes that may be allocated for research projects. For instance, the University incomes from teaching subsidies

and student tuitions in 2013 were exactly twice bigger than from research activities.

This unsatisfactory state of affairs comes as a result of a series of numerous reasons [Jasiński, 2014, p. 30]. This refers not only to University of Warsaw but generally to Polish universities. Still, there exist a big informational and emotional distance and a low level of trust between both sides: the world of science (not only academic) and the world of business (not only private).

At least one conclusion results from the above considerations: University of Warsaw urgently needs to have a strategy of research cooperation with the business sector. For this purpose, we have conducted an analysis of the market in the Mazovia voivodship, including our competitors on the supply side and the market segments on the demand side [*Zalozenia do strategii wspolpracy badawczej*…, 2015].

5. Circumstances and assumptions for the University strategy of research cooperation with the economic environment

In The 2008 Strategy of University of Warsaw we can find a note that 'the University should increase its activity in looking for external sources also through the cooperation (…) with a private sector'. Next, in an amended Strategy of 2014, there are notes on such necessary actions of the University as: the strengthening of actions in the transfer of technology and knowledge; a dialogue with entrepreneurs; the increasing of capacity to leverage own incomes, not from public sources; an improvement in the efficiency of knowledge commercialization; and the creation of a kind of business arena for research projects and grants [Monitor UW, 2014].

This is undoubtedly a good direction on the road leading to an entrepreneurial university. This road leads, first of all, through (a) commercialization of the University R&D work results, and (b) research cooperation with the business sector. The awareness is growing in the University community that it must follow this strategic direction, not resigning, of course, from the University most important, classic functions, i.e., teaching and researching.

According to De Wit and Meyer [2007], the process of creation and implementation of a university strategy consists of: a strategic thinking, a strategy formulation and a strategic change. Here we limit our considerations only to the first of these elements. The necessity of a strategic thinking/approach results from, among other things, the need for a longer time perspective in research cooperation between universities and the business sector entities. Therefore, such strategy should embrace, for example, five years (2016-2020). It must be, of course, integrated with a general, overall strategy of University of Warsaw.

A modern approach to the role of a university in its surroundings requires considering the whole complexity and interdependencies between internal and external ties. The internal context consists in the adjustment of internal University ties to a dynamically changing environment. If the external ties strongly determine a survival of a university as an independent institution, then there is a great importance of such

internal system that will be quickly and flexibly reacting to external signals and after processing will address them to relevant university units [Pluta-Olearnik *et al*, 2009, p. 12].

Now, as far as the external context is concerned, Leja [2013, pp. 232 and 281] formulates an interesting strategic dilemma[5]. Namely, how to create a university offer: Whether university researchers and managers should be driven by the environment's expectations (a demand approach) or should they shape these expectations thanks to available resources (a supply approach)? In the management of this dilemma, the stakeholder theory should be helpful where stakeholders are treated as partners who are being invited to co-create a value. In connection with this, according to Hamel and Prahalad [1999], one should make a step outside an orientation on the client. In our opinion, both approaches (via demand and via supply) should be taken into account simultaneously.

During a university research cooperation with the economic environment the market is more important than the academic institution. It is the market which must need research services and not the other way round. Koźmiński [1999, p. 239] sees a university as 'effectively functioning, entrepreneurial service organization that plays a very important social role'. Indeed, but one must be very careful because this university 'commercialization' may limit the freedom of scientific research and of other academic liberties. Many Polish and foreign authors pay attention to this, e.g. Leja [2013], Pluta-Olearnik *et al* [2009], Szpringer [2008], and Breznitz [2014] who adds that a university is not a profit-generating machine. In turn, Popławski *et al* [2013, p. 180] write that entrepreneurial behaviours positively influence a university's autonomy.

Since this is to be a strategy of research cooperation with market entities, it should be based, among other things, on a marketing strategy. This should be the **differentiated marketing strategy**. Shortly speaking, such strategy assumes the offer 'something different for everyone'. This means that for each of selected segments/target groups of a given market – in this case the research service market – a different product offer is prepared, differently priced, promoted and distributed or delivered to a given market segment (this is the co-called marketing-mix). Such strategy has two varieties. It may be:

a) a full-range strategy – if it embraces all segments of a given market (rarity), or
b) a non full-range strategy – if it is concentrated only on a few selected segments.

In the case of University of Warsaw we propose that it should be the strategy concentrated on priority segments acknowledged by the University, at least, at the beginning. The decisions on this issue should be taken by the University headquarters or by managements of schools/departments.

When a cooperation initiative is already undertaken, university schools/departments should create a kind of virtual organizations. According to Szpringer [2008, pp. 26-27], a virtual organization may be a temporary configuration of organizational units cooperating with each other to gain joint timed goals. This is a temporary creation being established for the period of a joint task/project, for example, a research project.

[5] He uses the term 'a strategic paradox'.

A new task initiates the virtual organization consisted of the organizational units having expected competencies. The aim of such organization is to deliver a product/ service at a requiring quality level, at minimal costs and over the shortest possible time, assuming a maximal added value at each phase of the value chain. Benefits connected with such choice of partners (or allies – AHJ) are evident and refer mainly to cost cuts, risk sharing and possibilities to fulfill the task [ibidem, p. 27].

There is no objection that such inter-school organization is based on an internal, sound coopetition and on a mutual trust which should not be difficult to gain because the University schools belong to 'the same family'. Frankly speaking, all cited authors pay attention to an extremely significant issue of trust between partners – both internal (in a university) and external (in its environment).

A concentration on the client grows in importance [Szpringer, 2008, p. 27]. Agreed, but let us remember that the appreciation of competitors also has a special significance. Here we mean, among other things, competitive advantages of a university. Pluta-Olearnik *et al* [2009, p. 84] mention three of them: tradition, authority and prestige. We should add an interdisciplinarity, wideness and differentiation of the offer based on exceptional competencies/specializations of University of Warsaw. These are the strategic trump cards important for the University stakeholders.

An extremely essential element of the strategy must be a proper way of a university communication with the business sector. All the mentioned trumps should be widely popularized during communication with the University environment. Such 'communication channels' can here be used as students (especially extramural), PhD students and alumni.

Next, ways of reaching various economic entities with the University offer will be differentiated depending not only on the size of an entity and a sector it belongs to. The ways will also depend on the character of the entity: whether it will be our customer, partner in a consortium, a firm implementing results of own research conducted in the University or an institution announcing public procurements.

In the process of research cooperation with the economic environment University of Warsaw can play various roles, apart from the one as an executor/performer of research services/projects. The University may play the role of:

- a cooperation initiator,
- an organizer/animator of the collaboration process,
- a participant in a strategic partnership, or
- an alien in consortia applying for research projects.

All the roles are recommended for University of Warsaw.

6. Conclusion

There is still a long road ahead of University of Warsaw towards the model of entrepreneurial university. There is an urgent need for a strategy of research cooperation with the business sector which should be based on marketing. The strategy ought to be:

- decentralized: the University schools/departments should be key actors on the cooperation scene, although there should be a central unit responsible for the strategy and coordination,

- interdisciplinary: perhaps a key competitive advantage of University of Warsaw can be seen in its interdisciplinarity,
- differentiated: forms and methods of the cooperation should depend, among other things, on who formulates the offer, what are its contents and a scientific character, and
- gradual: the cooperation should develop gradually, step by step, starting with segments recognized as priorities.

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Katarzyna ŁOBACZ, Piotr NIEDZIELSKI[1]

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THE INTERESTS OF MAIN STAKEHOLDERS IN THE COMMERCIALISATION PROCESS OF BUSINESS VENTURES WITHIN UNIVERSITY BUSINESS INCUBATORS

Summary

The justification and directions of support for business ventures by innovation and entrepreneurship centres are nowadays the subject of extensive scientific and political discourse. The paper aims at adding arguments to this discussion, based on the results of empirical research conducted on the basis of the case study strategy carried out among companies developing in such centres in Poland in comparison with more developed countries, including the UK, Belgium and Ireland. Particular attention is paid to the issue of involvement of key stakeholders at various stages of business development, including universities and their business incubators as well as potential investors providing key resources to this development, combined with general economic objectives the achievement of which justifies public expenditure on support of specific entities. The conducted analysis is based on the process approach in the framework of which characteristic phases of business development are distinguished, since the company's establishment to the point when it gains the potential for global development. The analysis shows first of all that there is no contradiction between objectives of individual stakeholders of the process, provided that they are properly targeted. University business incubators seem to be a good coordinator of these objectives if their activities are carried out in an appropriate manner.

Key words: commercialisation process, business ventures, university business incubators, stakeholders

1. Introduction

The contemporary literature indicates that one of the most important tools enabling economic use of knowledge, through formal [Agrawal, 2001], as well as informal [Acs et al., 2009; Audretsch, Aldridge, 2009] transfer channels, is entrepreneurship. First of all, it is stressed that innovative entrepreneurship allows to achieve the long-term economic growth. For example, the net employment growth in the USA in the last two decades of the twentieth century caused by the development of new entrepreneurial firms (less than five years old), [OECD, 2010; Janasz, 2004]. The so called technology firms play a special role in this process [Stawasz, 2006], causing an imbalance in the

[1] Katarzyna Łobacz, Ph.D. – Department of Effectiveness of Innovation, Faculty of Management and Economics of Services, University of Szczecin, e-mail: katarzyna.lobacz@wzieu.pl. Professor Piotr Niedzielski – Department of Effectiveness of Innovation, Faculty of Management and Economics of Services, University of Szczecin, e-mail: piotr.niedzielski@wzieu.pl.

market [Schumpeter, 1934] through commercialisation of breakthrough technologies [Kozmetzky et al., 2004]. One of the tools designed to stimulate such activities are university business incubators which are intended to form a bridge between universities, where new knowledge is created, and the economy. Business incubators, in particular those associated to universities, are nowadays seen as a key component of regional and national economic development strategies, supporting and strengthening the growth of economic sectors [Harman, Read, 2003]. However, when defining the role and tasks of incubators, the question should be answered: what conditions in functioning of university business incubators must be met in order for this objective (the economic growth and development) to be achieved.

The sense and directions of support for business ventures provided by innovation and entrepreneurship centres are nowadays the subject of extensive scientific and political discourse. Effects of activities carried out by business incubators in general and by university business incubators are not consistent in subsequent reports. On the one hand, it seems that their support determines the survival of a large number of companies and their development, on the other hand, there are examples of negligible impact [Clarysse, Moray, 2004; O'Shea et al., 2005; Rothaermel, Thursby, 2005] or even harmful effects. For example, in the USA reports indicate a 70-80% survival rate for companies in university incubators and 90% as the overall average, while the average survival rate of companies in the first four years of activity is less than 50%. Other studies show that the organization of the infrastructure supporting business operations does not meet the needs of university companies and inadequate resources to finance business support services can be a factor that hinders their development [Muent, 1999]. It can be assumed that such different results are derived from diverse quality of the support offered and its appropriateness in relation to the needs of specific companies. This seems all the more likely due to the fact that results derived directly from incubators meeting appropriate quality criteria show positive results according to different measurement indicators [*BIC Observatory 2010*, 2011]. All these doubts raise a question as to whether services offered by incubators are really important and should be subsidised.

The lack of clarity as to effectiveness of activities carried out by incubators is also connected with difficulties in identifying the essence of this effectiveness [Phan et al., 2005]. Typical indicators used to measure effectiveness of incubation programmes comprise the number of companies created, the number of jobs, the rate of survival of companies and the generated revenue [Campbell, 1989; Lyons, 1990]. In general, however, there is no consensus on success factors related to the support offered by an incubator. Due to the strongly manifested need for a more sophisticated, not necessarily direct, approach to the analysis of effects generated by incubators [Phan et al., 2005], many indicators for their measurement have been suggested over the recent years. In addition to studies encompassing key performance indicators, effectiveness of the use of tangible and intangible resources as well as critical success factors [Smilor, 1987; Allen, McCluskey, 1990; Mian 1994, Mian 1997], there are also benchmarking studies [*BIC Observatory 2010*, 2011; *ASTP benchmarking*], in which incubators are assessed in comparison to others with similar profile. At the same time, it is said that results of such benchmarking

studies cannot be presented in the form of an overall assessment. These analyses, however, neglect the aspect of indirect economic effects that should also have an impact on the decision making concerning subsidising specific support centres.

The above-presented ambiguities justify the need of the proposed research study. The paper aims at adding arguments to the discussion on potential effects generated by university business incubators, based on the analysis of objectives of key stakeholders involved in the process of development of incubating academic firms, combined with general economic objectives the achievement of which justifies public spending on support of specific entities. The analysis was conducted on the basis of results of empirical research based on the case study strategy carried out among companies developing in such centres in Poland in comparison with more developed countries, including the UK, Belgium and Ireland. The presented analysis is based on the process approach in the framework of which characteristic stages of business development are distinguished, since the company's establishment to the point when it gains the potential for global development.

2. Theoretical background

2.1. Commercialisation process of business ventures

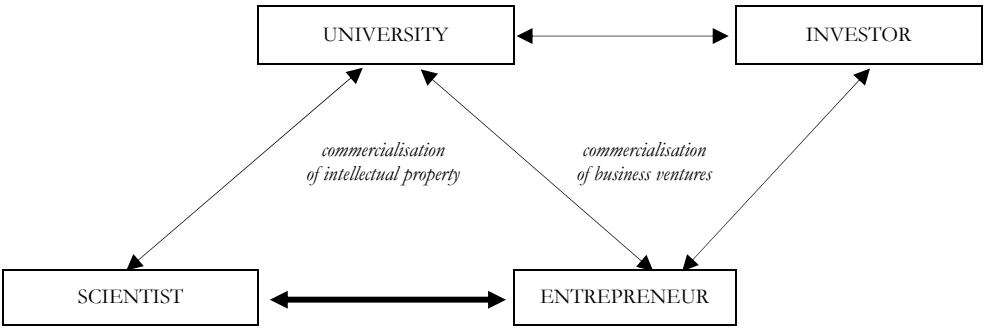
Commercialisation of research results, scientific achievements and expertise in the market is the essence of academic entrepreneurship and – depending on the technological or personal context – can take diverse forms. To be able to talk about such defined commercialisation, there is needed a new portion of academic knowledge (a combination of new knowledge or a combination of new and old knowledge), as well as an (academic) entrepreneur who perceives an opportunity for its application and takes actions enabling the transformation of this academic knowledge into economically useful knowledge and finally its market implementation. Effectiveness of the use of knowledge resources is measured by the difference between expenditures (public and private) incurred for their creation as well as effects obtained from their transformation [Lange, 1980]. Those are in general microeconomic terms revenues from sales [including the so-called innovation rent [Chen, 2009; Mazzarol, Reboud, 2009], and from the general economic perspective – the socio-economic growth and development [Romer, 1986]. In a wider perspective, commercialisation refers to the action undertaken in the search for a market opportunity associated with the use of new knowledge, acquisition and protection of this knowledge and resource configuration that enables its market implementation.

Given the context of academic entrepreneurship, it can be concluded that with respect to commercialisation of knowledge, there are two interrelated systems. It is schematically shown in Figure 1. One system is associated with commercialisation of intellectual property and the other with commercialisation of business ventures. Although both produce similar economic effects, they differ in terms of the balance of power and areas of impact on the processes taking place within. Other entities are engaged in commercialisation of intellectual property (the scientist – the university – the entrepreneur)

– where knowledge is commercialised by its codification, objectification and sales, than the ones that are involved in commercialisation through entrepreneurial activities (the university – the entrepreneur – the investor) – where the focus is on identifying a market opportunity and the use of knowledge in a way that allows its application. Some entities are elements of both systems, which determines their close connection. It follows that commercialisation of business ventures is very different from commercialisation of intellectual property.

FIGURE 1.

Systems of commercialisation



Source: [Łobacz, 2012]

Commercialisation of business ventures is thus linked to actively undertaking entrepreneurial activities. If academic entrepreneurial activity is seen in terms of a process, this process can be defined as aimed at building a product concept and its link with the process of transforming technological knowledge can be indicated. Based on the in-depth analysis[2], a model encompassing entrepreneurial activities in connection with commercialisation of knowledge, which is the basis for creating new market offers, was developed.

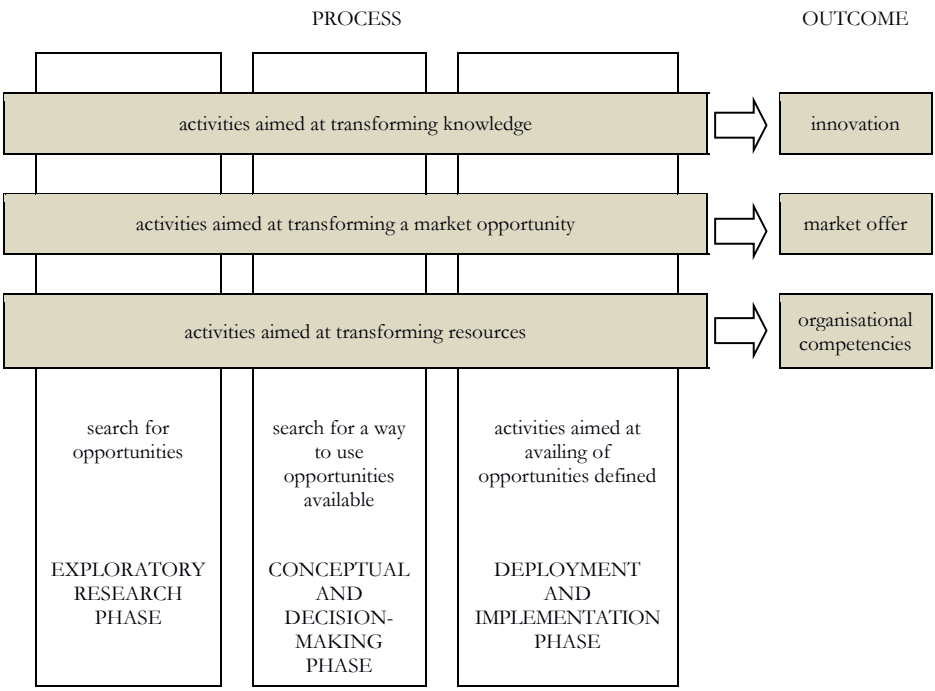
Since entrepreneurial activities are considered in relation to innovativeness, it seems appropriate to define activities related exclusively to transformation of knowledge into its economically useful form and then relate it to the entrepreneurial processes scheme. As the process should have an outcome defined at the end, the effects of actions related to creating a product concept are also included in the model. Based on those assumptions the process of development of the market offer has been described as consisting of three separate but strictly interconnected layers (Figure 2):

– activities aimed at creating a product concept associated with transformation of technological knowledge which result in innovation;

[2] A detailed analysis is provided in: [Łobacz, 2012].

– activities aimed at building a venture concept related to transformation of a market opportunity based on market knowledge which result in a market offer;
– activities aimed at building organisational competencies related to transformation of resources by using business expertise which result in organisational competencies.

FIGURE 2.
Layers of the process of commercialisation of business ventures



Source: [Łobacz, 2012]

Determining characteristics of individual layers of these processes and their analysis over time allowed the identification of five phases in the development of ventures related to launching successive products onto the market, associated with their innovativeness. It may be noted that the nature of the subsequent deployments, and thus the proposed market offer and knowledge used in their implementation, changes along with the development of capabilities and competencies of the company. In the subsequent phases, the approach to obtaining resources (including knowledge) and

the method for their configuration also change. Taking this fact into consideration, the following phases of business development are distinguished[3]:

- Phase 1: preparing a basic offer – which is related to hatching and initiating implementation of one's own vision of the venture; knowledge acquired through education and/or research and teaching work is commercialised; its transformation into a market product is a response to a market opportunity perceived through pursued interests and hobbies as well as being in the environment in which unmet needs are revealed, the business approach is usually typical, without any special features.
- Phase 2: improving the offer – occurs when entrepreneurs improve their offer, expand it, creating a portfolio of products (mainly service ones); these products are modified on the basis of improved knowledge and it is a customer-driven process as customers require solutions that meet their expectations; market opportunities are perceived through frequent contacts with customers and their communicated needs, on this basis a catalogue of products offered is created; the business approach remains typical, it is, however, more suited to customers' needs.
- Phase 3: building partnerships – occurs as a result of changes in philosophy of thinking about business; the offer takes the form of increasingly complex approach to issues related to needs that the company meets; it results from exploration of new possibilities (e.g. the search for new technological knowledge) as well as increasingly better understanding of market needs which can be met better than they currently are; limited resources make partnership crucial; it enables easy and flexible access to resources, especially ensuring provision of competencies which the company lacks.
- Phase 4: standardisation – is based on an expanded partnership; internal knowledge and partners' knowledge is used to create unique products; out of the catalogue of offers those that are rated as the most effective are implemented; there is a tendency for their standardisation.
- Phase 5: intense development of innovation – the transition to this phase requires the involvement of the company in their own targeted R&D activities; the offer is prepared for the needs of broad markets, at least on a national scale, but mostly on an international one (sometimes over a slightly longer time horizon; a gradual entry to new markets); the key to success is access to substantial financial resources (the company's own or external ones) needed for marketing and sales, sometimes also R&D activities.

Each phase is associated with implementation of a new market offer, however, it is possible to implement several offers at the same phase. This also means that each phase can last for an unlimited amount of time. The subsequent phases are associated with increasingly higher innovativeness, along with the development of companies it is therefore possible to commercialise increasingly advanced specialist (technological)

[3] The description of business development based on the indicated stages and the genesis of their determination is shown in detail in: Łobacz [2012].

knowledge. The further the stage of development, the more the scale of innovativeness of products offered shifts from incremental towards breakthrough one. Not only the idea but also knowledge on which it is based are subject to evolution. This, among other things, allows the company to create more advanced products.

2.2. University business incubators and their support for the process

University business incubators are seen as strategic tools of commercialisation of business ventures by universities. The strategic perspective, meaning not only commercialisation of the venture based on academic knowledge but also the potential for development on the basis of its rapidly forming new elements, is important in this respect. From this perspective, university incubators are accelerators of entrepreneurship based on new knowledge.

In general, incubators can be defined as entities established to coordinate the development of young companies, offering support services for business ventures and access to office space, which allows to achieve the company's objectives [Salman, Majeed, 2009]. The package of services offered by business incubators seeks to ensure the survival and growth of companies, thus maximising their impact on the economic development [Duff, 1998]. The above-presented definitions apply to the general concept of incubators, including characteristics of business incubators as such, without taking into account specific tasks that are associated with the operation of university incubators or technological incubators.

The distinction between university and technological incubators is not easy. In both cases, high significance of relations with research institutions and functioning in their proximity is indicated [Matusiak, 2010a; Ratinho, 2011]. Defining technological incubators, one more often draws attention to commercialisation of codified knowledge, resulting in new products [Matusiak, 2010a], whereas in the case of university incubators commercialisation of ventures based on the provision of services is more often referred to [Matusiak, 2010b]. Practice shows, however, that in the end such a division does not determine selection criteria, allowing ventures with the right profile into the incubator project. Sometimes university business incubators also include incubators created for the purpose of carrying out simple student ventures, as described based on examples of polish incubators by Matusiak [2010b]. This feature cannot be treated in permanent terms as the tendency to merge their activity profiles can be seen [Ratinho, 2011].

The essence of university incubators lies in supporting the university's activities in terms of commercialisation of business ventures that transfer academic knowledge into the market[4]. The type of transferred knowledge (overt-hidden), the resulting nature

[4] Such an approach to the function of university business incubators is also reflected in Polish legislation. According to the Act of 27 July 2005 Law on Higher Education [Journal of Laws 2005, no. 164, item 1365 as amended], the university business incubator is an entity related to the university, operating as part of the university or as a separate commercial company [Art. 86 para 3], which may be the sole property of the university or its ownership can be shared with other entities [Art. 86a para 1]. Regardless of the legal form, the created entity is responsible for the commercial "use of the university's intellectual and technical potential" [Art. 86 para 1] and "transfer of research results to the economy" [Art. 86 para 1] through "support for entrepreneurial activities of academia" [Art. 86 para 2].

of the venture (product based-service based), as well as the status of an individual entrepreneur (a student, a graduate-researcher, a Ph.D. student) do not matter in this respect. There are known examples of successful university incubators based on all four types of undertakings [Clarysse et al., 2005] as distinguished by Pirnay et al [2003], i.e. (1) product-oriented university venture, (2) service-oriented university venture, (3) product-oriented student venture, (4) service-oriented student venture.. The criterion of selection should be based on the relationship with the university and the degree to which it contributes to the achievement of its objectives. The issue related to the proximity of the location, which is related to the infrastructure of the premises occupied, is also important. Therefore the following definition is adopted: the university business incubator [UBI] is an entity occupying separate premises where ventures implemented by academia, organised by universities in order to commercialise academic knowledge through implementation of entrepreneurial activities and thus develop the entrepreneurial mission of the university, can be developed.

Objectives of university business incubators are mostly determined by the structure of the shares of institutions that organise these entities. Lalkaka [2000] distinguishes various objectives for the achievement of which incubators strive depending on their ownership structure (table 1). Since the organisation of proper infrastructure is associated with high expenditures and also requires additional operating expenses related to its maintenance, owners expect a return on investment in the form of significant benefits. Incubators often have several different shareholders/founders, which on the one hand leads to their strengthening due to the combined impact of many forces, but on the other hand means that they aim at achieving different objectives [Salman, Majeed, 2009].

TABLE 1.

Types of incubators and their objectives

Leading/financing institution	Objectives
universities	innovations, commitment on the part of academics and students
research institutions	research commercialisation
governments/local authorities	regional/economic development, job creation, poverty prevention
private sector	profits, patents, spin-off companies, image

Source: [Lalkaka, 2000].

With regard to public entities, which are also the incubator's founders, one can point out a certain contradiction associated with combining commercial and non-commercial objectives. If the entrepreneurial orientation of the university is to be an exclusively social function, it should be fully subsidised from the state budget. If, however, the university is to become a business entity and partly raise funds for its activities from

the economy, incubators must be a source of capital and allow the achievement of its objectives.

From the point of view of the university, financial and non-financial objectives can be distinguished. Among financial objectives, obtaining further funds for research and revenue from the sale of intellectual property should be mentioned[5]. Non-financial objectives include raising the prestige of the entity and extending its impact as well as establishing research collaboration [Price et al., 2008]. Building a reputation and strategic cooperation also indirectly translates into financial benefits (e.g. associated with increasing the number of students or attracting private capital for implementation of research tasks). From the perspective of the private sector, profit-driven orientation is important, profit which can be achieved in the short or long term. The revenue relates to the functioning of incubated companies as well as investors engaging private capital in their development. Orientation towards the rapid development of companies, their independence and the return on investment is one of the strategies used by incubators [Wright et al., 2007].

In practice, intensive national and European innovation policies make incubators public-private entities. Thus, their objectives need to coincide with socio-economic objectives. From an economic point of view, great importance of university business incubators in supporting the creation and development of new businesses is primarily indicated [Sherman, Chappell, 1998], which is reflected, for example, in encouraging potential entrepreneurs to start their own business [Aernoudt, 2004] by providing them with services supporting the development of business, marketing, management, capital raising, legal counselling and access to services and infrastructure that can be shared between companies. According to the European Commission [2002], incubators should accelerate and systematise the company's development. They should also support ventures characterised by high growth potential, creating jobs and increasing social welfare. At the same time, an important socio-economic role of incubators in ensuring the survival of new business, which need special targeted support for proper development [Lalkaka, 2000], is indicated. For example it is said that approx. 80% of newly created businesses fail in the first five years of operation [Salman, Majeed, 2009]. Thus, effective support for businesses at an early stage of their operations, shortening their learning curve, and assistance that enables their survival are considered essential. This approach reduces incubators to the role of purely business environment institutions [Markiewicz, 2010]. Whereas from a socio-economic point of view, one should pay attention to the role of university incubators in commercialisation of knowledge generated and transferred at universities, as well as the involvement of private capital in financing research and development activity [UKBI, 2012], which is one of the most important objectives of the current innovation policy [*Strategia lizbońska*, 2002; *Unia Innowacji*, 2010].

[5] According to the Polish Act of 27 July 2005 Law on Higher Education, the university can obtain profits through establishing, by means of specially set up targeted companies (limited companies), capital companies created for the purpose of "implementation of research results or research and development activities conducted by the university" [Art. 86a para 1]. The university can allocate dividends paid on activities of the targeted company to its statutory activities [Art. 86a para 4].

It should also be noted that there is a lack of conceptual consistency in terms of the definition used by authorities conducting the policy. On the one hand, it is said that incubators are important for the survival of companies, but on the other hand the high potential and dynamic growth of these entities are mentioned. These two approaches appear to be contradictory, for example, in relation to evolutionary models of Nelson and Winter [1982]. According to the evolutionary theory, supporting companies that otherwise would not survive is just unnecessary prolongation of their agony. And indeed, one can list many examples of companies that have ceased to exist shortly after leaving the incubator [Freeman et al., 1983]. However, support for companies with a high growth potential in the initial period, when it is necessary to incur significant expenditures on R&D activity to prepare a product for sale, is entirely consistent with objectives of the science and innovation policy. Therefore, strategies implemented by incubators usually include one of the following objectives [Wright et al., 2007]:

- economic, i.e. focused on generating profits and rapid business growth,
- social, i.e. focused mainly on the creation of new jobs (employment growth).

Regardless of the adopted social or economic perspective, university business incubators are established in order to assist in creating jobs and prosperity as well as to counteract regional economic problems and support commercialisation of new ideas and research results derived from universities and companies [Wright et al., 2007].

Numerous studies emphasise the importance of activities carried out by university business incubators [Kowalczyk et al., 2011]. The need to improve their quality [Albert, Gaynor, 2003] as well as to eliminate barriers that hinder the performance of these activities [*Ośrodki innowacji*…, 2009 and 2010] is widely indicated. The question arises, however, how these activities relate to objectives set for university business incubators from the perspective of key stakeholders and the economy. Taking into account interests of key stakeholders of knowledge commercialisation through implementation of business ventures (which is important from the point of view of their involvement), as well as economic objectives, requires incubators to focus simultaneously on three main objectives:

1. Commercialisation of academic knowledge.
2. Ensuring the survival and growth of companies.
3. Increasing investment capital involved in commercialisation of knowledge.

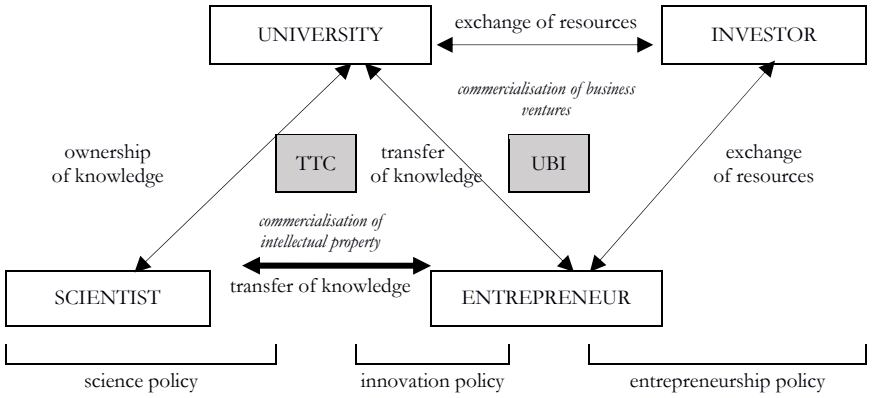
Striving to achieve such a bundle of objectives is indicated as a development trend of incubators [Ratinho, 2011]. They comply with the definition formulated by the UK Business Incubator [UKBI, 2012] stating that it is a dynamic process of business development aimed at supporting rapid growth of businesses and their survival, assistance in identifying investment opportunities and support for commercialisation of new knowledge. In addition, an important role of incubation in creating jobs and wealth, as a way to counteract problems related to the economic development, is indicated. To achieve this, the incubator can affect the process of commercialisation of business ventures, providing adequate involvement of stakeholders. Previous analyses, however, focusing on supporting companies, often ignore the importance of universities and investors in the process of commercialisation of knowledge, thus ignoring objectives important from their point of view. Tasks of business incubators

are generally considered only in relation to the added value generated for companies [Campbell et al., 1985]. However, taking into account objectives defined for university business incubators, the added value is important for each entity involved in the process, as well as for the economy.

2.3. Stakeholders of the process and their interests

The above-presented considerations indicate that university business incubators are expected to provide effects on the economic and individual level. There is, therefore, the need for balanced integration of objectives and expectations of key stakeholders [Ratinho, Henriques, 2010; OECD 1997]. It has been pointed out that such integration has a positive effect on effectiveness of activities carried out by incubators [Quinn, Rohrbaugh, 1983]. It is a condition necessary for stabilisation of the system, ensuring effectiveness of its functioning [Niedzielski, 2003]. Appropriate targeting of individual objectives will allow the achievement of general economic objectives. The relationships between objectives are presented in Figure 3.

FIGURE 3.
The role of university business incubators in the system of commercialisation of business ventures



Source: [Łobacz, 2012]

The presented diagram of stakeholders[6] and their objectives, which are translated into objectives of university business incubators and as a consequence into economic objectives,

[6] A similar diagram of stakeholders is presented in the analyses of Mcadam et al [2006]. They also take into account the significant interest of local authorities at the local and national level. In this study, local governments are, however, seen in the role of coordinators of economic objectives and they are included in the analysis in a subjectless manner.

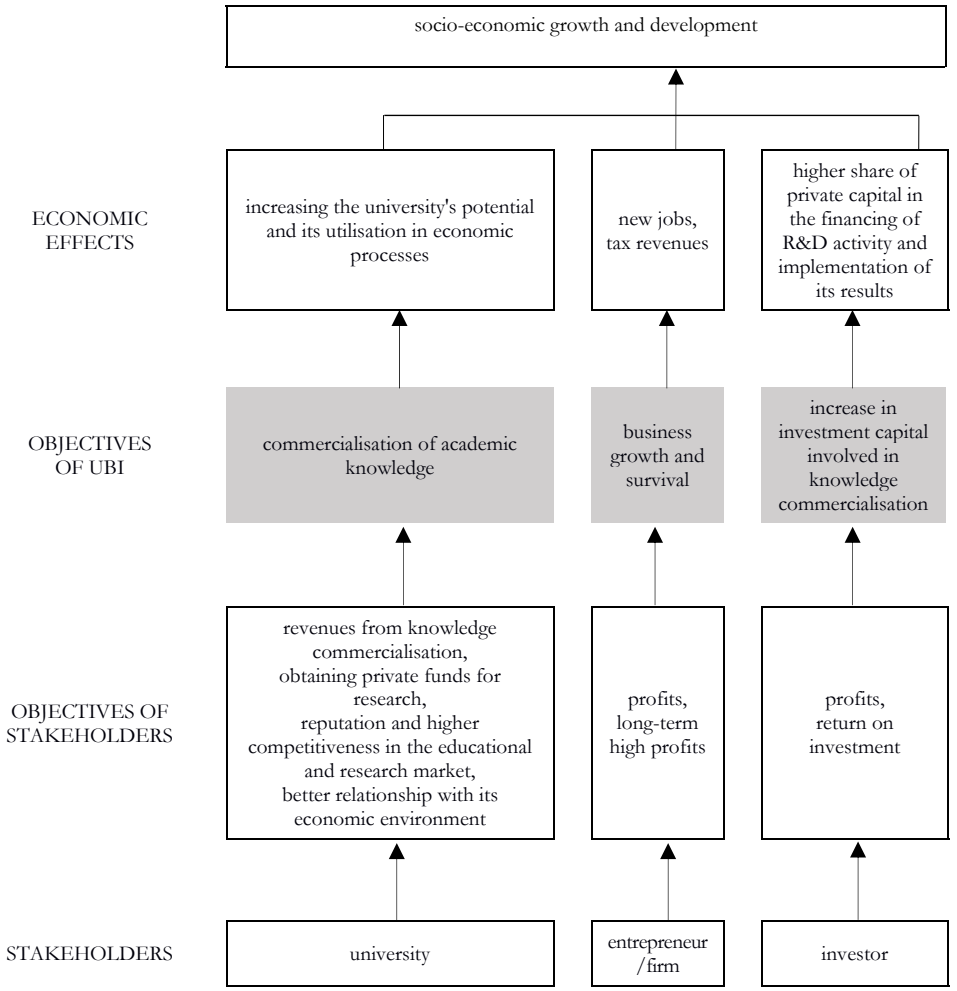
corresponds to the presented diagram of the systemic approach to commercialisation of knowledge in the university context (Figure 1). It takes into account key stakeholders of knowledge commercialisation and relationships existing between them. In relation to this system, the important role of university business incubators as coordinators of the system of commercialisation of business ventures can be seen (Figure 3). University business incubators, acting in conjunction with technology transfer centres, are designed to ensure the smooth functioning of the system of commercialisation in which objectives of stakeholders involved are achieved and (as a result) also general economic objectives [Trzmielak, 2011]. In contrast to tasks of university business incubators, the main tasks of technology transfer centres, as emphasised by Matusiak, include "informing about research work conducted at universities and the search for opportunities to sell research results, as well as the search for partners or customers for the next project" [*Innowacje i transfer technologii*…, 2011].

From an economic point of view, the university is only one element of the system which needs relationships with its other participants for its smooth functioning [Clarysse et al., 2005]. It should be assumed that the other entities will participate in the processes related to the functioning of the system, i.e. they will be willing to allocate their resources (time, financial and material resources, knowledge) if this allows them to achieve their own objectives. Thus, the task of university business incubators is such coordination of objectives of key stakeholders (including, in particular, universities, entrepreneurs and investors) so that they would contribute to achieving general economic objectives. Then commercialisation of knowledge through implementation of new business ventures will have individual as well as economic significance.

Despite the apparent convergence of objectives of different stakeholders, they can be achieved at different levels. In addition, the achievement of these objectives also translates into socio-economic benefits. Focusing on one objective or on a number of selected ones is a common practice. This applies to university business incubators as well as to politicians that design support instruments. It can, therefore, be assumed that ventures developing in university business incubators may be focused on specific objectives to varying degrees. Given the systemic nature of the commercialisation process of business ventures presented in Figure 4, it can be indicated that university business incubators have an impact on this process. Thus they may affect the achievement of specified objectives.

Since the smooth functioning of the systems also translates into the achievement of economic objectives at different levels, they remain in the area of the interest of politics. The overlapping of policies related to the stimulation of science, innovation and entrepreneurship necessitates their integration in order to be able to support the system of commercialisation of business ventures. The division of policy areas presented in Figure 3 is inspired by the Landstrom et al. [2008], adapted into the Polish conditions by Stawasz [2011].

FIGURE 4.
Objectives of the functioning of university business incubators in relation to different groups of stakeholders



Source: [Łobacz, 2012]

Although commercialisation processes are often associated with involvement of a large number of entities [e.g.: training companies, consulting firms [Ratinho, 2011; [Kowalczyk et al., 2011]], the presented system (Figure 3) includes only entities whose participation in the process is, firstly, direct, and secondly is of the investment nature [Price et al., 2008], (the expected return on activities conducted occurs only after some time and is not certain). Their participation is therefore associated with calculation –

evaluating profitability of the investment and its perception in strategic terms. The same applies to actions taken by the state which also invests through the system of grants and subsidies, expecting to receive a return over a certain time horizon. The use of network mechanisms to create value from innovation activities is recently indicated as a modern development trend [Niedzielski, Łobacz 2011].

Resource allocation is also associated with knowledge which in the case of all the related entities is of a strategic nature. It should be noted that every entity in the system is both a donor and a recipient, also a donor and a recipient of knowledge:

- The university is a donor of scientific knowledge, theoretical business knowledge, sometimes know-who, as well as a recipient of knowledge related to market demand for new solutions and educational programmes.
- The investor is a donor of practical business knowledge, including its most precious element – know-how and know-who, as well as a recipient of knowledge on new directions of the development of science and market opportunities.
- The entrepreneur is a donor of scientific knowledge and knowledge associated with a market opportunity as well as a recipient of scientific knowledge creating new market opportunities and business knowledge.

The university business incubator as a third partner is designed to play the role of a coordinator of resource exchange in this system. The tasks which it should perform in order to achieve these objectives ought to be indicated.

3. Research methodology

Based on the presented model, objectives of various stakeholders of the commercialisation process of business ventures in conjunction with general economic objectives have been analysed. Extensive literature studies concerning all university business incubators in Poland and selected incubators in developed countries of Europe were conducted. With their support, cases of companies developing within university business incubators in Poland were then analysed in comparison to companies from the UK, Belgium and Ireland. According to the classification presented by Yin [1982], the multiple case study model was adopted, recognised as a valuable approach in the study of small businesses [Chetty, 1996], mainly due to the ability to analyse single or complex research problems in the environment rich in variables affecting the context of operations [Eisenhardt, 1991].

Within the framework of the study, individual in-depth interviews were conducted [Oppenheim, 2004]. The formula of a narrative interview, using communication techniques, was adopted in order to focus the conversations on issues related to the subject of the study, at the same time assuming the greatest possible freedom of expression. In-depth interviews were conducted with owners or general managers of small innovative companies developing within university business incubators. The contents of individual interviews were recorded on digital media, which allowed them to be played back at the stage of data analysis. The theoretical sampling method was used [Yin, 1989; Eisenhardt, 1991]. Selection of further cases was carried out until saturation

of theoretical categories was achieved, without initial assumptions relating to their number. This procedure is consistent with the concept of the grounded theory of Barney and Strauss [Glaser, Strauss, 1967], assuming the selection process of further cases in order to compare them with those that have already been analysed. Finally, 52 cases of companies were analysed.

Conclusions from the study are shown below in the aggregate form, i.e. compiled results of all the studies presented broken down according to the logics of conclusions drawn. Those are drawn based on doctoral dissertation of the author [Łobacz, 2012], where more detailed analysis of the problem is presented.

4. Research results

The analysis based on the staged process of development of companies in university business incubators allowed to link its effects to objectives of individual stakeholders of the process. Referring to the three main stakeholders of the process, three groups of support objectives pursued by university business incubators were identified:

- commercialisation of academic knowledge,
- the growth and survival of companies based on academic knowledge,
- an increase in investment capital involved in commercialisation of knowledge.

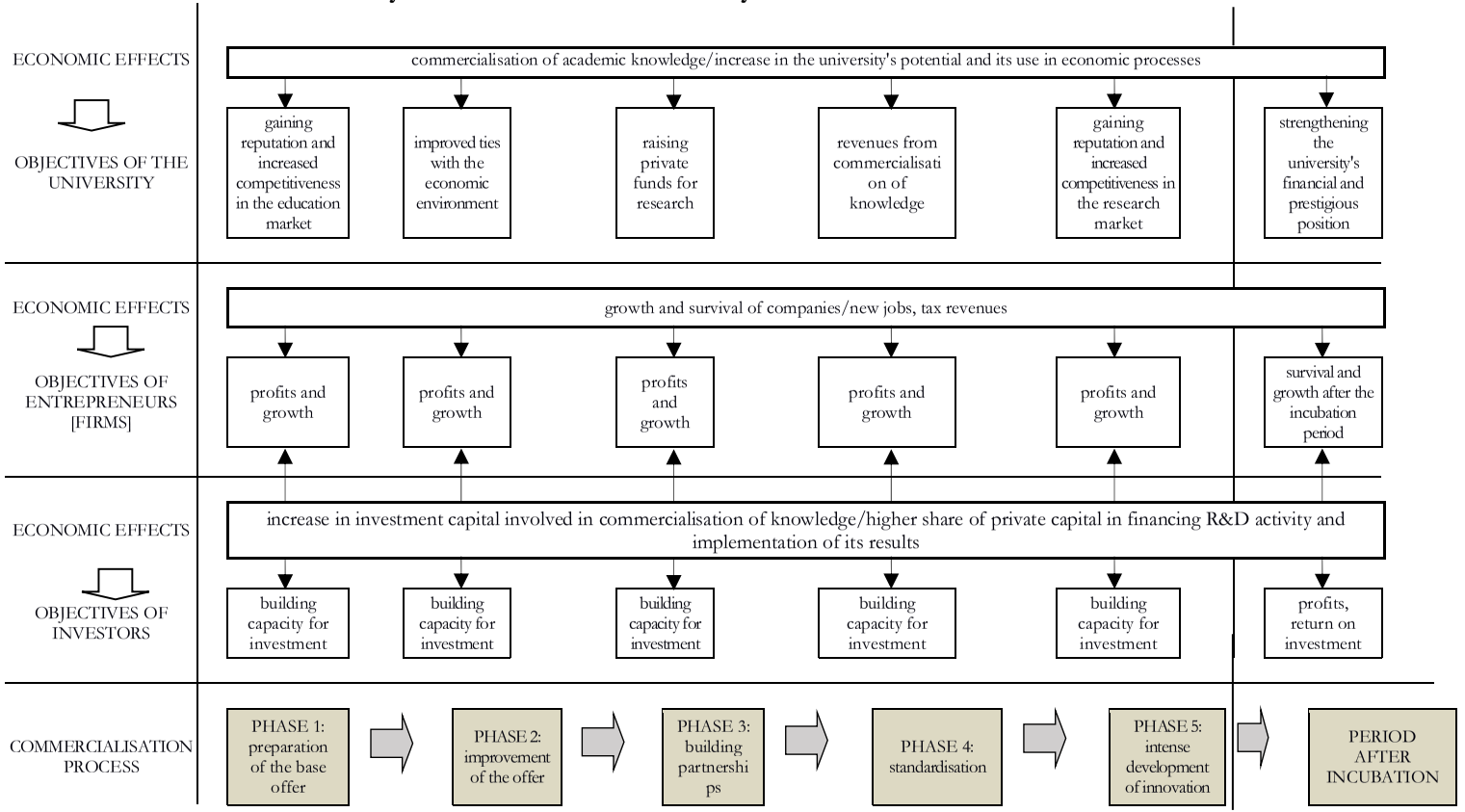
It has been assumed that achieving each of these objectives has a positive impact on economic effects [increasing the university's potential and its use in economic processes, new jobs, tax revenue, increasing the share of private capital in financing research and development activity and implementation of its results] having a bearing on the economic growth and development. It has been pointed out that the achievement of these objectives is conditional on the involvement of key stakeholders in the process, which, in turn, is dependent on the effects that these entities can generate as a result of the process. Therefore, three groups of objectives crucial to the process of commercialisation of business ventures in university business incubators have been identified:

- objectives of universities: revenues from commercialisation of knowledge, raising private funds for research, gaining reputation and increased competitiveness in the education and research market, improving ties with the economic environment;
- objectives of entrepreneurs (the company): profits, long-term good performance;
- objectives of investors: profits, return on investment.

These aspects were analysed in terms of the process approach and schematically presented in Figure 5. The lack of contradiction between objectives set by key stakeholders is an important conclusion drawn from this approach to the issue. It can be said that commercialisation of a larger amount and more advanced knowledge (one of the main objectives of the university) positively affects businesses' performance as well as private investors' willingness to commit resources to their development. This, in turn, determines the motivation and abilities to take actions oriented towards commercialisation of another portion of knowledge. It is possible only when certain conditions are met (e-.g. when the entrepreneur has sufficient business knowledge).

FIGURE 5.

The role of university business incubators in the system of commercialisation of business ventures



Source: [Łobacz, 2012].

In the case of the process of development of business ventures in university business incubators, it can be said that entrepreneurs contribute with their activities to the attainment of all objectives simultaneously. It should be noted, however, that it does not occur in a parallel manner but is assigned to the stages of development of ventures and depends on the strategy adopted by an entrepreneur. This applies in particular to the university's objectives related to commercialisation of knowledge. The transition between the subsequent phases in each case is closely connected with commercialisation of knowledge but it is not necessarily knowledge which has its source at the university.

It can be said, therefore, that the transition between the subsequent phases of the process means the ability to achieve the stated objectives, however, whether this occurs depends on many factors, for example, on entrepreneurs' access to knowledge or presence of adequate knowledge resources. Thus, it seems that university business incubators can play an active role in stimulating activities that lead to achieving the stated objectives, for example, by providing access to knowledge accumulated by the university – whether in the form of tacit or explicit knowledge that can be commercialised. This also applies to implementation of appropriate criteria for selection of business ventures for incubation support, aimed at selecting those ventures that are strongly associated with the university's activity profile (in practical terms, selection not guided by political correctness, as is often the case).

The analysis of Figure 5 also indicates that various objectives are achieved as a result of implementation of the process. The diagram shows the point at which the objective is achieved in absolute terms. However, it can be also noted that the level of achievement of the objective increases over time. For example, revenues from commercialisation of knowledge may increase as a result of the entrepreneur's success (if a license agreement for the use of a new technology is signed, the seller obtains financial benefits in the form of a percentage of revenue obtained by the buyer), they may also be increased by the multiple sale of intellectual property rights by the university. The same applies to profits and growth of companies which increase over time.

The presented considerations also indicate that the achievement of stakeholders' objectives is only possible when they are engaged in the process. For example, gaining reputation and competitiveness in the education market will be possible only if the university implements appropriate programmes focused on entrepreneurship from which budding entrepreneurs will be able to draw knowledge and inspiration to take action towards commercialisation of knowledge. Creating the environment from which potential entrepreneurs derive their first ideas and business contacts is one of the key factors that have an impact on undertaking entrepreneurial activities. Similar conclusions can be applied to investors for whom obtaining profits is the result of investment decisions taken at the fifth phase of the process.

Thus, despite the assignment of the possibility of achieving objectives to the subsequent phases of the process, it is not done in an automatic way. Whether the university achieves its objectives depends essentially on two factors: the relationship between the entrepreneur and the university, as well as the willingness on the part of university staff and the university itself to cooperate. In turn, investors' objectives can be accomplished if there is a meeting between the investor and the entrepreneur

accompanied by a mutual exchange of expectations. This shows great importance of the creation of network relations in the course of the process, which was included as one of the important tasks of university business incubators.

Commercialisation of academic knowledge brings with it many implications leading to the strengthening of the university's financial and prestigious position and an increase in its capacity which should be used in economic processes. It should be noted that it is carried out not only as a result of implementation of the subsequent phases of the process but through successive iterations in the framework of individual stages. This applies particularly to raising private funds for research as well as revenues from commercialisation of knowledge. There may in fact be situations in which at each subsequent iteration at a given phase of the process the sale of another portion of intellectual property will occur, which will result in multiplication of revenues. Generally, one can therefore say that more iterations mean commercialisation of a larger portion of knowledge (provided that at each iteration a new portion of knowledge is commercialised). At the same time – due to the variety of objectives assigned to the subsequent phases and also to the fact that specialisation of commercialised knowledge increases along with the development of the venture – from the point of view of the university's objectives, the transition between the subsequent phases is important.

The objective associated with investing funds (the investor's objective) is achieved at the fifth phase but all the previous phases form its foundation. It should be noted that, in some cases, an investment may also occur at an earlier stage but then commercialised knowledge is not highly specialised and is associated with the possibility of obtaining smaller profits yet carries a lower risk.

The objective of entrepreneurs, as indicated earlier, is, however, achieved at each stage of development, with increasing intensity. Case studies show that, with multiple iterations within the same phase, there is some stability to implemented measures and profits. However, prolonged repetition of these actions leads companies into the trap of lack of growth and loss of ability to resolve the stalemate. In turn, the development and an increase in the level of profit is possible due to the transition to the subsequent phases of the development. In carrying out their activities, entrepreneurs also invest capital in commercialisation of knowledge. Despite the small scale of these investments, their importance should be seen as significant in terms of increasing the participation of private capital in financing R&D activity and implementation of its results.

5. Conclusions

The analysis based on process approach indicates that objectives associated with survival and development of firms. It has been observed that lack of development and transition to the subsequent phases means the collapse of the company after a certain period after foundation. Therefore, the focus on the current situation and repeating schemes of actions within the same phase of development leads to stagnation, exhaustion of the potential and consequently to the company's collapse after a longer (in the case of more stable markets) or shorter (in more dynamic markets) period of time. It

has been indicated that companies are able to expand their business activities in the incubation period of 2-3 years, passing through all the five phases. To make it possible though, coordination of factors affecting this development is needed. Thus, slow growth of businesses in some incubators is usually an indication of their business failure soon after the end of the incubation period and objectives of individual stakeholders as well as general economic objectives are achieved at negligible levels (usually ending at the second phase).

Furthermore, due to their potential to innovate and grow, ventures developing within university business incubators can contribute to achieving a variety of economic objectives, thus responding to objectives set by stakeholders. To do this firms need flexible access to resources which can be provided by all stakeholders. This means that stakeholders, including universities, can stimulate activities aimed at accomplishing their objectives through direct involvement in the process and thereby target better activities undertaken by companies in university business incubators.

At the same time, the research results based on the process model indicate that there is no contradiction between objectives of individual stakeholders of the process and general economic objectives. The stage-based process of commercialisation of business ventures indicates that the transition between the subsequent phases enables the achievement of successive objectives, both economic and individual. The level of achievement of particular objectives may, however, depend on flexible access to resources. This access can be actively supported by business incubators adequately to phase of development of particular venture or group of ventures.

Referring the analysis to the presented layers of the process, it seems that the key to achieving objectives is the layer of knowledge transformation. For example, whether and which objectives are achieved by the university is determined by whether and what kind of knowledge is commercialised. This, in turn, determines the transition between the subsequent phases of development, and thus means profits for companies and investors. The other layers, however, affect the level at which the transformation of knowledge can take place. For example, knowledge alone is not enough to be able to obtain venture capital financing, as adequate resources and business skills that will affect the success of commercialisation are also required. Thus, also appropriate business competencies, market knowledge and other physical and human resources, which are accumulated at the subsequent phases, are needed in order to achieve the set objectives.

On the other hand, a company may perform well with very little academic knowledge or lack thereof. With the adoption of an appropriate business model, a company may also get financial support from an investor. This means that the university may drop out of the value chain, which may limit the economy in terms of growth. New knowledge that arises in scientific units is not included in the economic cycle and does not create new market opportunities. Thus, it seems that the focus on all stakeholders simultaneously achieving their objectives should produce the most optimal – from an economic point of view – effects. A lack of contradictions between their objectives should therefore be the basis for providing support (e.g.: through university business incubators) to achieve objectives important for universities.

6. Discussion and implications

The studies described in the paper provide the evidence that the potential of university business incubators is in fact not fully utilised by all stakeholders of the commercialisation process of business ventures, which is confirmed in other studies of the European area, although it is indicated that incubators are potentially an effective tool of the innovation policy. Ratinho [2011], examining where companies based in business incubators seek assistance in solving their problems, state that there are three such sources: the incubator (the incubator's administration), other companies located in the incubator and external network contacts. Based on statistical analyses, they also show that support is mainly sought outside the incubator. Interpreting the results obtained, they point out weaknesses and limitations of the system of support offered by incubators, at the same time calling for better adaptation of services to real needs of companies (along with their growth and development, businesses do not receive from incubators the support needed to solve their problems – incubators are not capable of providing it).

Another conclusion, derived from research of Ratinho [2011], confirmed by the conducted study, is lower demand for the incubator's support for entrepreneurs who already have experience in running a business. Burton et al. [2002] have also demonstrated that an entrepreneur's professional experience has an impact on the initial strategy adopted in implementation of a venture. According to these authors, experience determines the way of thinking about the market and the business, as well as the ability to obtain specific resources. This relation, according to the research results presented in the paper, also has a significant impact on the transition through the subsequent phases of development. Ratinho [2011] draws attention to importance of selection criteria for ventures chosen for support. At the same time, demand for support has an impact on indicators related to effectiveness of actions taken by incubators.

Although the results of research undertaken from the perspective of the process approach described in the paper show the same relationships, they suggest a different explanation. On their basis, it can be concluded that the demand for support is dynamic as it depends on the development stage of the venture. This means that along with increasing heterogeneity of the venture in its subsequent phases (in the early stages, activities are more homogeneous), the need for cooperation and specific (more specialised) support increases. This confirms great importance of learning through partnership, as indicated earlier by Yli-Renko et al. [2001] and building competencies through relations with other organisation, as elaborated by Grant and Baden-Fuller [2004]. The incubator, in accordance with the principles of effective functioning, is able to provide support of a more general nature. Therefore, one can interpret this relationship in the following way: in order to increase effectiveness of the support provided, incubators should focus primarily on creating opportunities (e.g. providing access to a network of contacts) rather than on developing a portfolio of services provided by their own employees. Effectiveness of support can then be considered in relation to how quickly companies become independent to the extent that assistance in their survival and development is no longer needed. After incubation, companies should be able and willing to continue cooperation with the incubator (which may derive further profits from this cooperation),

as well as (and perhaps primarily) with networks of contacts established during the incubation process, including, among others, the university.

It should be noted that, in relation to objectives set (and their achievement), any policy will be largely ineffective if there is not enough social maturity. The analysis of guidelines that define the current policy of promoting entrepreneurship through university incubators, leads to the conclusion that the support is well targeted but the achieved results are far from expected. A good example in this case can be selection criteria of companies that are eligible to make use of the privilege of incubation. Despite the fact that the criteria follow in the wake of the needs regarding the university's objectives associated with commercialisation of knowledge, in practice their use proves to be very shallow. As a result, the flow of knowledge from the university to the economy is limited, there is also little involvement of funds provided by outside investors. The performance of companies is also not very impressive, although many of them have very high potential. Maturity of social capital is currently indicated as a key barrier in the system of commercialisation of knowledge and technology transfer, which has also found its reference here [*Rekomendacje zmian*…, 2011; Niedzielski, Łobacz, 2012].

It follows that the impact of university business incubators may be important for the development of companies, thereby contributing to generating economic growth. They can play an active role in stimulating activities whose driving force is striving to achieve the stated objectives. However, it should be noted that the scope of support needs is dynamic, changing along with maturity of companies and their transition to the subsequent stages of development. This means the need to adapt support to changes taking place in the course of the development of companies so that it can be effectively allocated.

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Stanisław ŁOBEJKO, Alicja SOSNOWSKA[1]

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MANAGEMENT MODELS OF A SCIENCE AND TECHNOLOGY PARKS: FOREIGN EXPERIENCES AND RECOMMENDATIONS FOR POLAND

Summary

The paper presents four management models of a scientific-technological park built on the basis of the in-depth analysis results of fifteen selected parks in the world. The basic functions of the park were discussed as well as the pros and cons of each model showing the possibilities for their further development. The reference was made to the Polish conditions, indicating that two corporate and network models are the most suitable for Poland. The corporate model based on the active cooperation of technical universities and public and private entities is, according to the authors, the most suitable for use in the case of science and technology parks located near a technical university. The corporate model is an alternative to the network model which allows to create science and technology parks with a dispersed spatial structure.

Keywords: science and technology park, models of management, creative space, network approach, research and development

1. Introduction

The subject of this research paper is science and technology parks as the structures that have been participating in the process of the translation of research achievements into economic practice over fifty years. A lot of experience has been gained during these years, searching for more and more effective models leading to the achievement of the primary goal set for the parks since the very beginning of their existence – to boost the results of research conducted by universities in the economic and social dimension, focused on creating innovation that supports economic development. The first parks, established in the USA and Europe, were strongly connected to universities and as they became more popular and developed, they evolved into more diversified forms. This has led science and technology parks to emerge as separate organizations linking various entities within a certain region, beyond the border of a region or even a country. The processes of globalization, internationalisation of research, the invention of the Internet and the development of the broadly defined network economy have played

[1] Assoc. prof. dr hab. Stanisław Łobejko – Collegium of Business Administration, Warsaw School of Economics, e-mail: slobej@sgh.waw.pl. Prof. dr hab. Alicja Sosnowska – Szkoła Wyższa im. Pawła Włodkowica w Płocku, e-mail: alicja.sosnowska22@gmail.com

a particular role here. Thus the 21st century methods and models of management of science and technology parks, contrary to the 20th century, have evolved. Along with science or science and technological parks, industrial parks, industrial and technology parks or even clusters have appeared. Besides the goal to transfer technology, additional objectives have appeared aimed at region development, employment growth, the stimulation of international cooperation, etc.

Hence, it seems to be appropriate to broaden the definition of the science and technology park in the context of cooperation with a single university or more than one university and to distinguish it from other structures defined in literature, such as technology parks, clusters or business incubators, etc. It is especially significant in terms of defining the role of science and technology parks for today's entrepreneurial universities and to the growth of a region and the economy in general.

The aim of this paper is to present the way to reach a new model of a science and technology park as a network organization and to indicate the options to choose within the park management structures and its regional and international relations.

Based on the literature and interviews conducted among selected national and foreign parks, the authors of this paper state a thesis that today's science and technology parks strive for the integrated model operating in the network economy, organizationally separated from the university that combines the research activity with the activity of both a production and a service company and realize innovations that bring measurable economic and social benefits[2].

At the same time, we would like to draw attention to the fact that parks operating in various countries are diversified, even though the goals they pursue are quite similar. The cause of this diversification is the need to adjust to the local environment. It gives the opportunity to choose an appropriate and individual park management model. However, it should comply with the legal framework and the general system of management rules [*Setting up…,* 2014, pp. 63-67].

All the aspects mentioned above require to specify the definition of a park and determine some institutional and financial standards it operates in. Since the practice of creating parks and its functioning indicates that as organizations of this kind have spread, problems have appeared in distinguishing a science and technology park from other organizations that mediate in technology transfer between science and practice, such as industrial parks (which gather enterprises that implement innovations in the industry) or a cluster.

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[2] The paper presents conclusions based on the international research of science and technology parks, carried out by the authors, as part of the initiative called: *Przestrzeń Kreatywna – Miasteczka Kreatywnego oraz Południowego Obszaru Aglomeracji Warszawskiej*, cofinanced from the European Regonal Development Fund. The whole project was conducted in the period of October-November 2014 for the Pro-Development company. The research included 15 parks and they are as follows: Adlershof Park (Germany), Zentrum für Luft und Raumfahrt Schönefelder Kreuz (Germany), Barcelona Science Park – Parc Cientific de Barcelona (Spain), Mediterranean Technology Park (Spain), Advanced Technologies Park/Ben Gurion University (Israel), Delaware Technology Park (USA), Virginia BioTechnology Research Park (USA), Manchester Science Park (England), Technopolis Oulu (Finland), Australian Technology Park (Australia), Hong Kong Science and Technology Parks Corporation (Hog Kong), Uppsala Science Park (Sweden), Sophia Antipolis (France), Birmingham STP (England), Cambridge Science Park (England).

2. The concept of a contemporary science and technology park

A science and technology park is an important part/element of the innovation system of the country located in the area between the science and business and mediates the transfer of research results into business practice.

The awarding of science and technology park significant role in the national innovation systems also involves the assumption of an active participation of the state in the process of organizing and financing development of the park.

For the purpose of this study, it is assumed that the name of a science and technology park can take an organization that involves scientific and research organizations interested in the transfer and commercialization of technology infrastructure as an important component of R&D of innovative companies involved in the commercialization of innovation projects.

It is assumed that a science and technology park has close ties with the university and other research institutions. It cannot, therefore, be called a science and technology park of regional clusters of companies cooperating in the implementation of specific strictly business objectives. According to the classic definition of M. Porter it is a cluster. There is also a technology transfer center park, business incubator or another organization that serves the basic functions assigned to parks.

Not being bound to theory, it is assumed that a science and technology park is a structure (organization) which combines scientific and business activities thanks to the interaction of R&D and innovative companies using a common physical infrastructure and intellectual capital operating within the park organization of R&D and business. From experience we learn that operating parks that are usually involved in the business park combine territorial proximity, often sharing a particular area and volume and the joint management unit. The detailed arrangements for their ownership, financing, and powers of the liquidator and the participation of the park in the benefits derived from the commercialization of the projects and activities of enterprises are different and depend on the nature and structure of the park and the adopted management model.

The nature of science and technology determines the ratio between a part of the scientific and business ownership and industry (domain-), the specificity of the research activities and production and services. World experiences differ in this range widely. However, you can find some common features. As indicated by M. Weresa the concept of the park contains elements of research and business [Weresa, 2014, pp. 129-135]. The research part of maintaining a constant relationship with the university allows access to infrastructure and academic staff with high qualifications, which provides a high level of research undertaken, partly financed with public funds and efficiently transferring research results to continue their implementation by a business honor. These business area laboratories and companies implement innovations and benefit periodically from the surface and park infrastructure on the terms of a favorable lease and periodic tax preferences.

In the business you may also find place park tenants operating units offering services in network infrastructure, business administration and accounting, and design and training services [*Strategiczne obszary*…, 2011, pp. 15-16]. Both parties benefit from the

combination of scientific and business parts in the immediate vicinity. Scientists provide direct cooperation with business and the ability to track further production and trade effects of the submitted projects. The benefits for business are particular access to information and research results, the possibility of permanent contacts with scientists, obtaining location for companies in the space of the prepared infrastructure, access to training offer and the possibility of cooperation with business partners also present in the park.

Additional benefits of co-location in a science and technology park could create a friendly environment – there are environmental, educational and cultural, sports centers found in many parks created abroad. All of this together adds up to define the creative space, which means a cluster of organizations and people making creative element in science, education, business, health and culture. They form what R. Florida calls the creative class environment. A creative class consists of people whose economic function is to create new ideas and concepts i.e. new creative content.

In this way, a lot of science and technology parks have created a kind of creative community conducive to the development of innovation and increasing the competitiveness of the business part of the park. The objective of creating such a community can be a leading idea for instantiation model park management. In an attempt to analyze existing and develop new models for the management of scientific and technological park, it is assumed that:

- Firstly – all models include acting through the park both scientific functions described above as well as business;
- Secondly – the park is an entity defined territorially and administratively;
- Thirdly – participants of (members of) the park are scientific institutions (universities, institutes), entrepreneurs, business start-ups, academic, public (aid organizations - PARP ARP) and social organizations (associations, engineering organizations);
- Fourthly – choice of models using foreign experience, but with a possibility to adjust them to the Polish conditions;
- Fifthly – it assumes creation of a central unit acting as the park with organizational and managerial functions in relation to other participants in the park.

The proposals are the framework which can provide a basis for discussion and then after the election must be made more precise and adapted to local conditions.

3. Models of management systems of a science and technology park

On the basis of available knowledge, as it seems, the following models of a science and technology park with their corresponding management systems can be extracted:

Model I – a university science park - the park is an integral part of the university,
Model II – an independent organization – a Limited Liability Company,
Model III – a corporate park – a stock company,
Model IV – a network park.

These models have been separated according to the criteria of ownership and management system. In the following parts characteristics of these models along with an attempt of preliminary assessment of the advantages and disadvantages of adopting a given solution are presented.

Model I – University science park

The basic functions of the park is creating a campus on a university, or in the immediate vicinity some special space and infrastructure to enable research carried on by university staff and students and – implementation works along with the ability to create business start-ups and spin-offs. The premise of the park is creating an innovative environment for innovators and enabling them to transform themselves into entrepreneurs. The University may provide certain services to the participants of the park and researchers working in the park who may provide educational services for example conducting graduate work of students, running laboratory classes for students, etc.

At the same time, the task is to create space conditions (area for research) and staffing to allow intensifying research that has its origin among the university staff. A park is administratively a separated part of the university having its own unit manager who, however, as subject to the rector's authorities fulfills the obligations arising from the statutes of the school and benefits from public funds (grants awarded to universities for research) and university infrastructure. The university participates in the means developed by companies belonging to the park. To reconcile the independence of the companies set up in the park and conducting commercial activities within the administrative structures of universities is a very important issue. This can cause a lot of conflicts. Thus, participants in the park after reaching commercial success are interested in reaching their independence (autonomy).

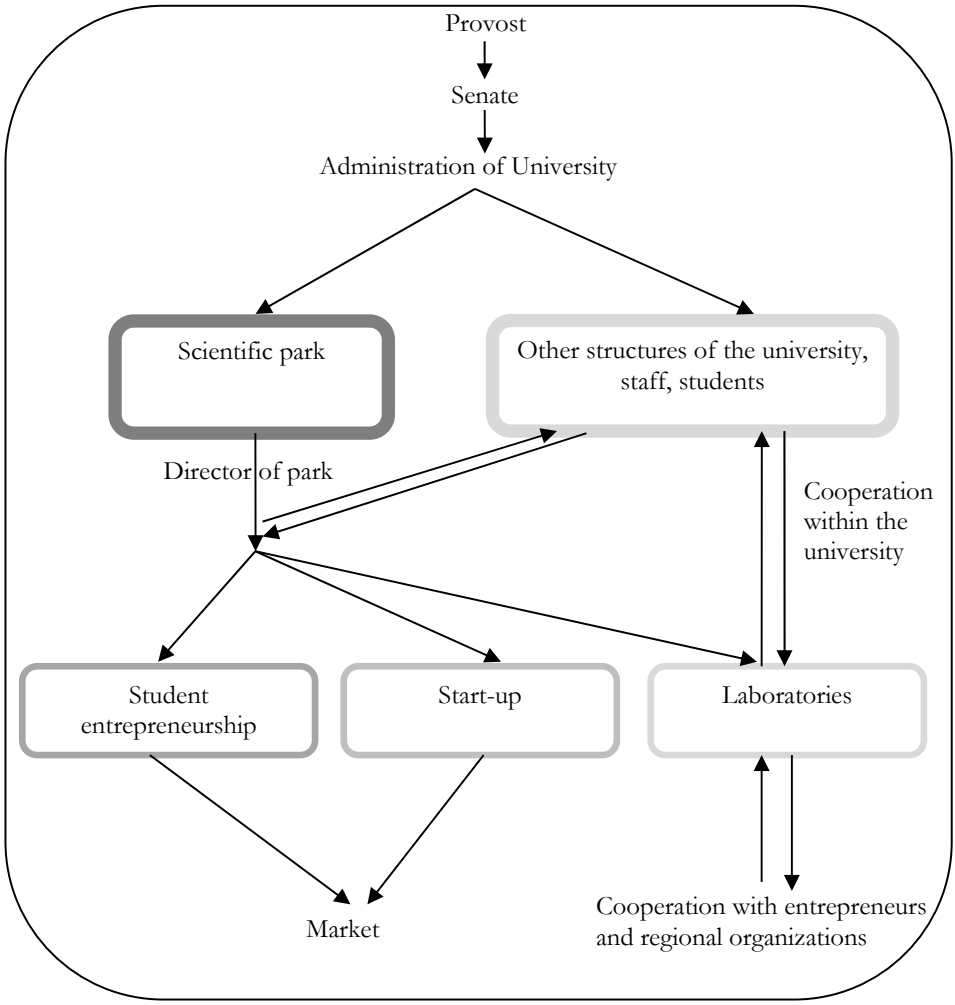
As shown in Chart 1, a university park is a separate administrative unit incorporated into the administrative structure of the school, allowing working closely with researchers conducting scientific work at faculties and laboratories as well as the creation of separate research laboratories and service units under park management. The level of independence of the parks management both in conducting research (selection and ways of financing research topics) and in commercial activities (acceptance of orders, sales projects) is essential.

Advantages of the university model:

- close contact with the university which enables the smooth takeover of subjects capable of being commercialized in the structures of the park,
- free flow of information and academic staff between the university and the park,
- the use of administrative units of the university to support the park,
- the use of common infrastructure,
- connecting the park with the university brand [*Analiza*…, 2014, p. 49].

CHART 1.

Model of the science park structure operating within the university



Source: author's own work [*Analiza*…, 2014, p. 49].

Disadvantages arising from the operation of the park in the structures of the university:

- limiting independence in decision making,
- the need to introduce at the university often bureaucratic procedures resulting in prolongation of decision making,
- the university is to blame for park failures or sometimes vice versa,

– difficulty in separating the financial responsibility of the park and the university [*Analiza*…, 2014, p. 49]

These disadvantages cause that the university model, although proven in some American parks, receive criticism. Park participants negatively evaluate in this model a lack of independence and bureaucracy resulting from close ties with the university. However, in many cases, an important role of science and the significance of the university prevail in decisions about choosing this particular model. Moreover, the career of the leader park is also relevant. The scholar will be inclined to choose a university while the manager-entrepreneur is willing to choose the structure with greater independence. The analysis of some specific examples indicate that there is a wide variety of organizational solutions adopted for the university parks.

Model II – Independent organization separated from the university on a company status

Just like the previous one, this park model fulfills the scientific and research functions linked to business but is a distinct organization separated from the university, possessing its own headquarters and infrastructure, which is responsible for the results of operations of the entities belonging to it on its own.

The shareholders of the park on a company status are: the university or several universities, research institutes, innovative companies and organizations, regional development agencies, funding agencies as for example PARP, new venture capital funds as well as local government units (municipalities, counties). It is, therefore, a structure connecting both public and private companies. Together, as determined by the statute, they participate in financing investments, have joint responsibility for the activities of the company (according to the contributed shares) and share the benefits.

The Company is managed together by the president and management board and cooperates with the supervisory board elected by the shareholders of the park. According to the assumptions, the tasks of the park should be performed by both scientific research teams and innovative companies reported to the park by shareholders or approved by the park on the principles of tenancy. Different solutions about the functioning of the park and the rights of shareholders to benefits may be accepted. The base is always the company agreement and the statutes of the company.

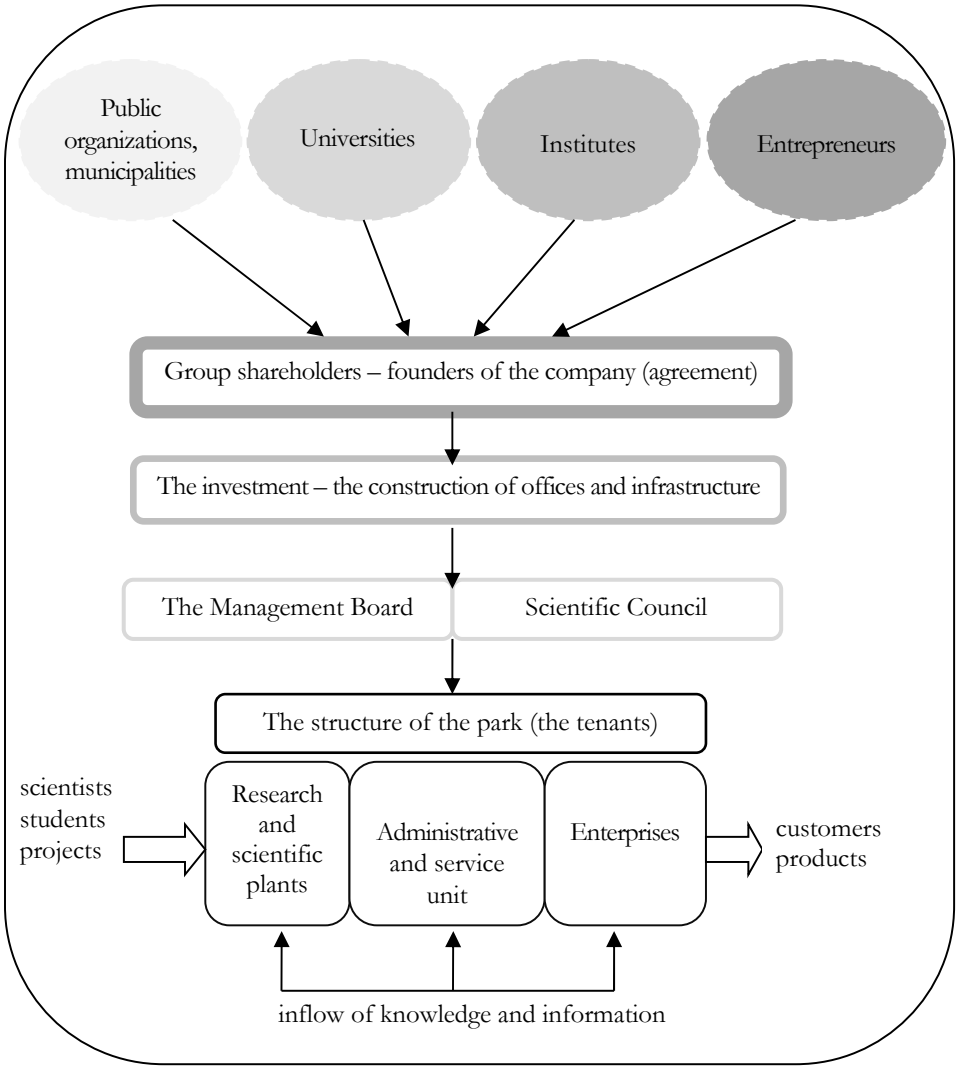
Within this structure, especially in the first period, founding requires capital expenditure on the premises and its equipment, the creation of partners who will tie their future to the park and most of all research teams and entrepreneurs who want to participate in the development of the park. The fact that the park is a distinct science and business space also gives you the ability to create the so-called zone around the park to provide park tenants mutual not only scientific, but also social contacts, to exchange ideas and facilitate collaboration. There is also the possibility of building sports infrastructure, clubs, cafes, etc.

The model of the park, as an independent unit in the process of creating a park is shown in Chart 2. The figure presents the process of building the park, as the company's shareholders coming out of university (there may be several), research institutes or private funders interested in the commercialization of research results and

business stakeholders, who are interested in locating their businesses in the infrastructure of the park. Shareholders are the founding group, which initiates the construction of the seat and park infrastructure then follows selecting a park management board and a scientific council, which together create the park infrastructure and invite future tenants. The next step is park organizing and its management.

CHART 2.

Model of the park, as an independent unit in the creation process



Source: author's own work [*Analiza*…, 2014, p. 51].

Advantages of choosing such a solution are as follows:
- a park is an organization separated from universities and other participating organizations on the basis of shareholders and such a system goes beyond the university structure;
- a separate Board of Directors and Scientific Council bears full responsibility before shareholders for the operations of the park;
- the Board has the opportunity to choose tenants of the park and the employment of workers according to the needs;
- apart from scientific activity and production it is possible to provide services and conduct information activities (e.g. Training);
- strong pressure to achieve positive financial results;
- structure of the park allows free access for many of the participants of the park [*Analiza*…, 2014, p. 52].

The disadvantages of this solution are:
- requires a significant initial capital investment;
- the risk that university employees may not want to move their activities to the park;
- a significant number of shareholders may hamper distribution of financial results;
- a long transition period from the start of investment to achieving economic benefits;
- uncertainty as to the fulfillment of obligations of shareholders agreed in the first period [*Analiza*…, 2014, p. 52].

Model III – Corporate park

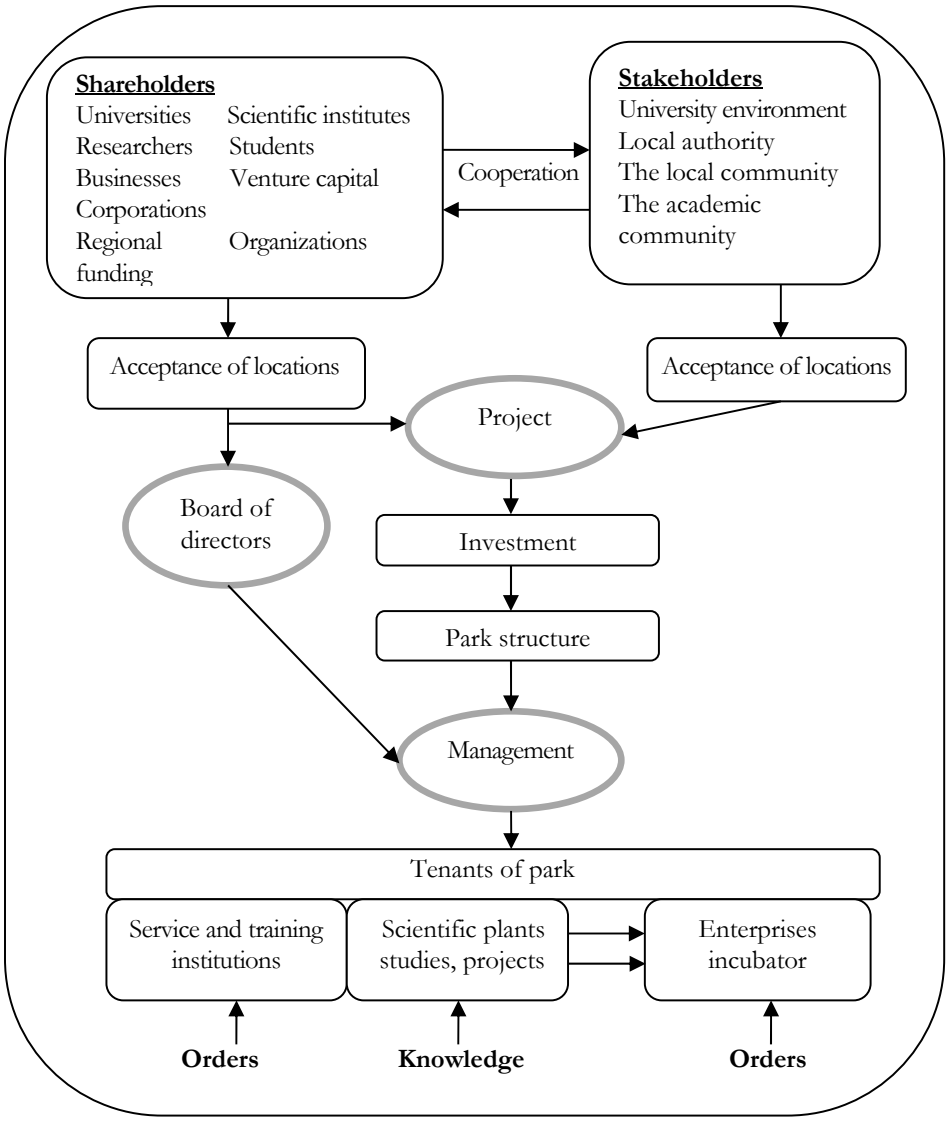
The park is an independent organization established by a group of public and private founders acceding to the company as shareholders commencing business activities focused on the potential possibility of a return of capital in the long term. Leading shareholders make an initial capital as a result of the public sale of shares. Initial capital may constitute grounds for the park investment, financial resources, also from venture capital funds as well as intangibles like patents, licenses, new technologies implementation projects.

The park after a period of investment creates a space where companies conducting research or implementing the commercialization projects as well as start-up companies providing production or services can be located. All companies belonging to the park are its shareholders and participate in the business results. It is possible to exit the park and regain independence on the principle of spin-outs. In this model, it is assumed that after the first period of operation, when the park relies heavily on external capital (loans, grants) it can start working on the corporate principles.

It is significant that the corporate model is based on the use of cooperation of the aforesaid shareholders and stakeholders. These include local authorities and the local community interested in the park location (jobs, infrastructure), entrepreneurs – potential customers of the park, other than shareholders potentially collaborating research institutions built around the park in the creative space.

CHART 3.

Model of the corporate park



Source: author's own work [*Analiza*…, 2014, p. 54]

The park manages the board chosen by the founders and a board of directors appointed at the shareholders' meeting. The details of the management system are included in the articles of association adopted by shareholders. From the potential success point of view, an individual leader – chairman of the board, who should be

an efficient manager with high qualifications combined with working experience in the scientific community, is extremely important.

Potential advantages of the model III

- A park organized according to the proposed rules is a complex structure.
- A potential large shareholder can provide initial capital and inflow of funds for the functioning by selling shares.
- The strength of the park can be power and brand shareholders as for example renowned universities and achievements of scientists working there.
- A park can find appreciation and acceptance of the local environment and local authorities [*Analiza*…, 2014, p. 55].

Disadvantages of model III

- The size and complexity of the park can be dangerous blurring responsibilities and causing organizational inertia.
- The main problem may be the lack of a potentially large, appropriate to the size of the park number of innovative projects.
- A significant size of the park may make it difficult to operate the infrastructure.
- There may be difficulties in integrating the business scientific community because of a large number of employees [*Analiza*…, 2014, p. 55].

The corporate model of the park is shown on Chart 3. It presents the process of building the park as independent organization created in close cooperation between groups of shareholders and stakeholders. An important feature of the process of creating the park is that is implemented as an individual project. After creating the park management is executed by the management team subordinate to board of directors.

Model IV – Network park

The network model assumes that the organization of a science and technology park is formed as a relatively free network system and the management of the park serves as an orchestrator managing and coordinating the activities of independent scientific and business entities cooperating directly or through a network orchestrator. Research institutions or teams of researchers and companies act as nodes of the network. Communication between them is carried out primarily by Internet, it might be online contacts, teleconferencing and other means available by the electronic media. Extensive use of the network allows access to the park not only geographically close, but also remote entities and individuals. Therefore, some entities can be included from other regions in the country, as well as foreign cooperating organizations. In constructing the management model of network, a scientific and technological park needs to specify the basic objectives of the whole organization, functions of the entities participating in the park, the principles of cooperation between the entities, tasks for an orchestrator and its role in relation to the other members of the network. The terms also require the park relationship with the social environment, the authorities and a wider scientific domestic and foreign community. The primary objectives of this kind of a scientific and technology park is to organize cooperation in research and development and the creation of companies implementing innovation projects through the creation of an Internet platform for exchanging information and projects, conducting discussions, conferences in the frame-

work of park members. Participants of networks are, therefore, a set of knowledge and skills directed for creating products and services complementary to each other and designed to achieve scientific and business objectives multiplying the value created by independent organizations that have declared their affiliation to the park.

The roles of an orchestrator are:

- approving of the function of a park founder,
- developing an organizational concept and statute of the park,
- formulating offers for potential participants,
- opening a cooperation platform
- establishing contacts with potential sources of funding for research and implementation (government and EU funds, venture capital, sponsors, foreign organizations);
- searching for customers projects and partners for business;
- marketing innovation;
- organizing international cooperation.

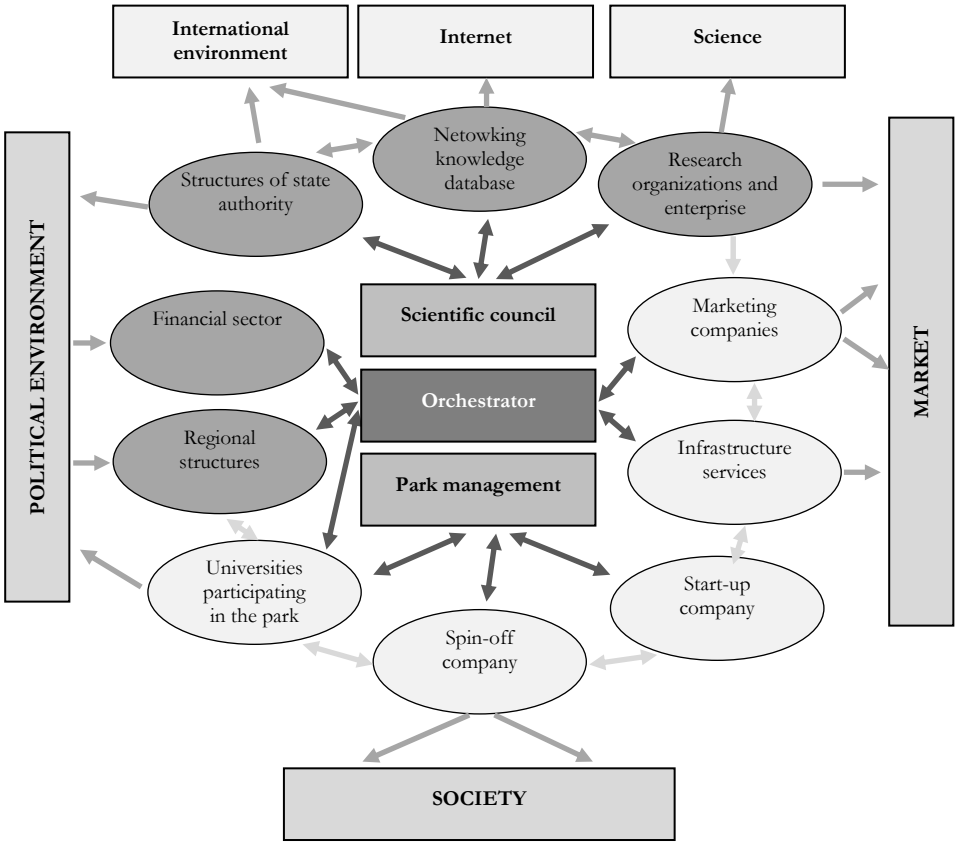
The Management Board of the park (a network orchestrator) next to financial coordination functions can perform representative functions, but also can administer the material infrastructure of the park also ensuring the exchange of services in this area between the participants of the park. Assuming the organization and economic self-reliance, entities orchestrator's role is to invest in the development of mutual relations and the functioning of information flows on the basis of reciprocity and mutual benefits relative to contributions made. The basis for successful functioning of the network model is the trust of partners, loyalty in the relationship and sharing risk. The proper functioning and management of the network structure of the park also requires the fulfillment of certain technical requirements. Information systems of entities belonging to the park because of the different tasks assigned to them can differ. Networking requires adjustment and compatibility of individual systems. It is a prerequisite that allows seamless flow of information [Łobejko, 2012, p. 27].

Chart 4 shows the idea of a science and technology network park management system model. It presents a diagram of network connections in a network park model assuming the central role of the scientific council and the board (management company), as a network orchestrator consisting of both ambient units cooperating with the park, but not belonging directly to the strategic area and entering the corporate network directly associated with the management of the park under concluded agreement on cooperation.

In this model, the park board acts as a coordinator in the terms stipulated in the contracts and while belonging to the park, companies have a legal personality and economic standing as well as they are responsible for the commitments.

CHART 4.

The management board connections network model



Source: author's own work [*Analiza*…, 2014, p. 58]

In the chart the strength of relationships has been marked with shades of gray: an orchestrator (dark gray), companies related to contracts (middle gray), and environment organizations (light gray).

Advantages of the network model:

- this model uses measures offered by modern information economy, thus characterized by a high level of modernity;
- participation of entities belonging to the network is voluntary and does not rule out an independent economic activity;
- internal structures and strategy of the network model can be easily adapted to the needs in accordance with the will of participants of the park;
- management system can be based on the principle of consensus and participation in the decision-making process [*Analiza*…, 2014, pp. 58-59].

Disadvantages of the network model:
- complexity of the connections and open access could hamper the formulation of common goals and putting them into effect;
- a complex system can generate costs arising from the incompatibility of information systems;
- division of tasks and responsibilities between park management and leadership of the park participants can be difficult [*Analiza*…, 2014, p. 59].

4. Possibilities in network cooperation amongst enterprises

Enterprises that operate on the basis of cooperation with technology parks, operate in branches of industry with end-products being capital-intensive. All essential investments connected with gaining knowledge and doing research usually exceed enterprises' abilities. Overcoming these barriers may be possible by joining the network with other companies. Cooperation within the network is possible wherever participants share common interests and operate in similar domains despite geographical dispersion. Being a part of a network enables them to achieve the synergy effects that all the parties involved benefit from. Networks mainly give possibility to share knowledge more quickly, new ideas in particular, which is *sine qua non* of the innovation creation process. What's more, within the network cooperation there are organized lots of events, such as meetings, conferences, access to experts or various databases, where the main role is to lead to information exchange. Additionally, they stimulate the technology transfer and provide easier access to the clients and new funding sources. They also give the possibility to compare themselves to local partners and those operating abroad. Last but not least, networks diffuse and strengthen the use of the so-called good practices, which positively affects the efficiency of work, inside and outside the organization.

Operating within the network is a specific form of interaction between a company and its business environment. It not only ensures the external relations to be coherent and structured, but also enables taking advantage of business solutions as a good source of benefits for a company. Expanding cooperation with entities such as universities, research centres, associations or other enterprises in a harmonious way is also one of the advantages of networks. In a traditional approach to the economy, enterprises treat competitors as rivals that they can only compete with. However, from the network perspective, cooperation between competitors is also possible and yields profits to both sides. As for the market in the context of a network, competition is not a zero-sum game where if one wins the other loses. Companies operating inside the network gain more profit than those performing outside.

In the business environment of companies, apart from the typical professional networks, there are a lot of networks specializing in certain tasks. One can name these specializing in fundraising for its participants. Small enterprises usually encounter problems with financing their development. These constraints mainly stem from the banks being reluctant to finance uncertain projects. From a bank perspective small entities have a weak position on the market and a lack of experience in the finance market

so their finance offer is usually worse than for big companies. Being a part of a network specialized in fundraising, such as the European Business Angels Network (EBAN) or the European Venture Capital Association (EVCA), gives an opportunity for small and inexperienced enterprises to gain some financial resources for development.

Expansion of relations and the so-called networking are the benefits, among others, that companies can gain through operating in a network. Thanks to that the company and its employees can monitor current changes in a given branch and also gain information about current and planned activity of competitors and cooperating companies.

5. Conclusions

The conducted analysis of the selected foreign science and technology parks allowed to formulate four main models of park management. These models in different variations are used in the management of science and technology parks in the world. The study confirms the relatively great diversity of solutions used in practice. However, you can find a clear distinction between applied management solutions into two groups. The first group was formed by models I and II based on close ties with the university, focused on creating of start-ups and academic incubators. The second group of management models are models of type III and IV, used in complex park structures, often without taking up area, which holds up the organization, but forming a network of alliances based on concluded contracts for specific tasks, not only in terms of the commercialization of research, but also covering other areas of business.

Taking into consideration the conditions of the Polish economy and the functioning of R & D, the authors believe that the most appropriate for managing a science and technology park are two models: a corporate model and a network model. As Polish and foreign experience has shown only strong and of high standing scientific research technical universities are able to independently undertake a park development initiative. In the case of Polish technical universities in the implementation of park initiatives, it is necessary – according to the corporate model – that there was inclusion of both public shareholders and private, who are interested in the potential possibility of a return of capital in the long term. Forming the corporate park management is also beneficial for the university located in the park because they do not have to become directly involved in park management that performs on their behalf designated for this purpose corporation management.

The financial support of public and private shareholders for the development of the park is also significant. A network model is the second worth a recommendation for Poland model for managing a science and technology park, in which the board of the park plays the role of an orchestrator managing and coordinating the activities of independent scientific and business entities. In this model, a science and technology park form teams of researchers and companies joined and working together in an interactive manner based on computer networks. Thanks to this, cooperation is possible not only with entities close geographically but also those from other regions, including foreign ones. Past experience in the development of science and technology parks

indicate that the network model park in the future will play an important role in the development of R & D and the commercialization of research results.

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Ewa OKOŃ-HORODYŃSKA[1]

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REGIONAL INNOVATION STRATEGY AS ONE OF THE FIELDS FOR RESEARCH IN INNOVATIVE GENDER (INNOGEND)[2]

Summary

The documents of the European Commission's European prospects for 2020 emphasise, in a special way, that the equal participation of men and women is essential for Europe to exploit the full potential of innovative strengths. Innovativeness is in fact vital for the development of a knowledge-based economy and society. Due to its importance, it is promoted by instruments such as an innovation strategy and policy. The proposed article titled "Regional Innovation Strategy (RIS) as one of the fields for research in Innovative Gender (InnoGend)" indicates how preparation and implementation of RISs may become a research field in assessing the role of women and men in the innovation processes resulting from these strategies. In the analysis regional innovation strategy in Małopolska is used as an example. Therefore, the article contains two threads. The first one focuses on the evaluation of women's and men's involvement in the creation of strategic documents constituting in what way is their potential used to boost innovation. The second thread is a pilot proposal of methodology for describing and assessing the role of women and men in the implemented innovation process.

Key words: innovation, innovation strategy and policy, smart specialization, gender, Integrated (Gender) Innovation Genom

1. Introduction

Almost every European document or programme these days deals with creativity and innovation or the challenges forcing the development of new ideas, products, or regulations. Despite the ever-increasing levels of globalisation, IT expansion changing the traditional manufacture processes and labour patterns, the rapid development of certain Asian countries, which should be a driving force for enhanced innovation activity in the EU member states to retain their leading position on the global markets, the European Union is still struggling with a three-fold crisis of substance, trust, and power [Kukliński, 2011]. This leads to the institutional weakening of the European Union

[1] Prof. Ewa Okoń-Horodyńska – Department of Economics and Innovation, Jagiellonian University, e-mail: ewa.okon-horodynska@uj.edu.pl.

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on the global arena and to the expansion of procedure-driven thinking which, in turn, results in the enhancement of controls limiting the freedom of choice and hampering decision-making processes. Nonetheless, the general tendency to open the European Union to global challenges is preserved and subsequent programmes and strategies are being developed, postulating the intensification of research and innovation in all member states. Hence, innovation has been given a prominent role in the new Europe 2020 Strategy and in the Innovation Union one of its "flagship initiatives". In the search for sources of new opportunities for creativity and innovation, attention is drawn to another phenomenon requiring support.

Recruiting and retaining women in scientific and technical fields is seen as a key to success for the 2020 Strategy. A number of studies and reports have stressed the acute problem of women's under-representation in science in the business enterprise sector. Whilst women represent over 35% of all researchers in the higher education and government sectors of most European countries, this is not the case for the corporate sector. The percentage of female researchers in the business enterprise sector is less than 25% in most countries [EC, 2010]. Yet another flagship initiative under the 2020 Strategy, the New Skills and Jobs Agenda, focuses on the need to modernise labour markets, increase labour participation and match labour markets and skills. Studies show that the European labour shortage is likely to have a greater impact on female or male dominated occupations rather than on less divided sectors [EC, 2009]. Occupations in healthcare and ICT are already affected by the shortage of professionals in Europe. For example, the rapidly growing demand for ICT specialists was one of the motivators behind the European Code of Best Practices for Women and ICT launched by the European Commission [Vinnova, 2011].

"Equal participation of men and women is essential for Europe to exploit the full potential of innovative strengths – not only for demographic reasons, but also in case of innovation processes and results. There is a need to clarify what (new) cluster policy relate measures can support the process to get more women involved in the innovation process of business and research" [SIT, 2011].

The proposed paper entitled "Gender in Regional Innovation Strategy: the case of Malopolska" focuses on the indication of the role of women and men in the preparation of one of the most important strategic documents for the development of the regions which is the regional innovation strategy and their place in the process of its implementation.

2. Smart Specialisation Strategy (SSS) as the Foundation of a Regional Innovation Strategy (RIS): and what about Gender?

Although the smart specialisation concept is most commonly associated with the application process [Foray, David, Hall, 2009], it may be worthwhile to find a theoretical substantiation for it, combining the explanation of the emergence of national (and regional) innovation systems, foundation of the innovation policy, model of open innovation, and the strategic thinking ability stemming from foresight research. In fact, the concept of SSS does not cover the issue of Gender. It originates from the

beginnings of the theory of economics (international trade and research on comparative advantages), [Ricardo, 1821] and it has evolved in various directions over time. The concept of the national innovation system (NIS), after it has been incorporated into the theory of economics [Freeman, 1987], is used to demonstrate that its efficiency ensuring a competitive advantage reflects the measureable level of innovation of a given economy. It specifies what technological, institutional, or systemic factors determine the ability to generate, absorb and spread innovation in individual countries, resulting from the feedback between the broadly understood research potential and the state policy facilitating the creation and dissemination of knowledge products. It is also the way to shape the framework of national innovative potential which reflects the abilities necessary to create innovation and build the culture of innovation in various areas of the economy, and which – in the global perspective – can be evaluated and measured. All NIS' definitions point to the importance of the multi-dimensional, internally interactive, and externally coherent structure of the NIS, which makes the allocation of existing potentials logical and channelled towards a combined or individual generation, and the selection and absorption of innovations, most importantly technological ones. Hence, the allocation of resources cannot be accidental and the structure of the NIS provides for a method of defining the object of allocation (area, specialisation) ensuring maximum economic and social benefits at a given moment combined with a vision of achieving competitive advantage in a longer perspective. The NIS is also a set of separate institutions, jointly or individually contributing towards the development and diffusion of new technologies, forming a framework for governments to define and implement the innovation policy (IP) aimed at influencing the technological choices and the operation of innovative processes. The IP has tools and instruments (mechanisms, programmes and measurements) to influence, either directly or indirectly, the choices of the type of innovation activity made by individual business entities, of research specialisations by individual research units and teams, or of transformation directions in selected industry branches, thus shaping the innovative structure of the economy. What is the basis for such choices? On the one hand, it is an economic calculation, and on the other – expectations as regards the state's support for selected forms of activity. Hence, it could be said that IP is a strategic and supra-sectoral part of the structural policy, with the key objective to support selected areas, ensuring economic benefits and a high position in the innovation ranking. It is therefore a process of never-ending rational, not random, selection. Although the basic structures of the NIS do not clearly indicate the issues of Gender, it is difficult not to notice that it may find its application in many of its aspects. In particular, the issue of gender in the NIS should be considered by the importance of intellectual potential (ability, creativity, competence men and women) and even more broadly – social capital (and here the specific behaviours of women and men for the development of innovation).This requires research on innovative gender that combines the roles of women and men with the process of innovativeness and creativity. If female innovativeness and creativity is manifested differently than male innovativeness, and if male innovativeness is taken as a gender-neutral model, then some dimensions of innovative and creative behaviour is overlooked in economic models and policy prescriptions. Insufficient use of gender innovativeness limits social

and economic progress and hampers gender equality. Therefore, learning about special aspects of female and male innovativeness could result in finding new sources of progress, also through the elimination of the existing barriers. It is possible that public policies supporting innovativeness are gender-biased. If such policies promote male-type innovative behaviour, treating innovativeness and creativity as gender-neutral, specific female innovativeness may be unnoticed and not supported, making innovativeness more difficult for women than men. The introduction of the innovative gender concept will indicate what incentives are needed in order to promote gender equality in the areas of innovativeness and creativity. In this aspect, the use of the potential of gender may be influenced by proper instruments of the innovation policy which have already been mentioned.

Unfortunately, it is difficult to discern Gender in the official studies of the NSI, as well as innovation policy instruments for such a specific use of the effects, although there is a substantive justification, as already mentioned. Gender issues are not included in the filaments as foresight studies, which are of great importance in building a long-term vision for the development of resource utilization. The underlying idea of foresight is to present thoroughly substantiated visions of the future, which should encourage social actors (men and women) to get involved in their development. It can be said that foresight is and on every research level has always been about identifying the areas of science, key technologies, and strong potentials for the economy and society, on which the most successful development strategies (in terms of the economics) can be built, and which provides answers to the questions: "What can happen in the future?" and "What can we do now to ensure a long-term competitive advantage and a better quality of life for the citizens?". The adaptation of the foresight concept to regional research, consequent upon the shift in perception of the development potential of the regions in the context of globalisation, have produced new experiences that prove helpful in the EU strategic works and have introduced foresight research on the regional level, unfortunately again bypassing Gender.

The concept of smart specialisation, although it has its theoretical substantiation, is much more political in practice. To be able to face the global challenges and internal incohesion, the European Union needs an ambitious economic policy to mitigate the effects of its structural and institutional weaknesses. For the European Union, maximising the investments in innovation and entrepreneurship to address the economic crisis will be a political indicator of advancement in the 2014-2020 financial perspective. The vision of this initiative is presented in the latest European Union strategy [*Europe 2020 Strategy*, 2010]. By gathering experiences and perfecting its former strategic approach, the European Union suggests that the research and innovation development strategy should be created on the regional level where the existing potentials can be best identified and utilised. This should be done with the use of uniform methodology [*RIS3Guide*, 2012] to identify regional specialisations that will ensure a competitive advantage. The RIS3Guide is. Thus useful for decision-makers, actors implementing strategic tasks, and beneficiaries, because it shows how to design, prepare and implement the innovation strategies accounting for new aspects and possibilities to perfect the existing knowledge resources as well as for new ways to utilise the knowledge, making the strategy

and policy efficient. RIS3 is helpful both to countries/regions (politicians, scientists, entrepreneurs) already experienced in devising and implementing innovation strategies – showing the results achieved so far and opportunities for improvements – and to those for whom RIS3 is a new challenge – providing them with step-by-step instructions on how to do so. So, the concept of smart specialisation is 'smart' for two main reasons [*RIS3Guide*, 2012, p. 15].

Firstly, it links research and innovation with economic development in novel ways such as the entrepreneurial process of discovery and the setting of priorities by policy makers in close cooperation with local actors.

Secondly, this process is carried out with an eye on the outside world, forcing regions to be ambitious but realistic about what can be achieved while linking local assets and capabilities to external sources of knowledge and value chains.

Identification of smart specialisations is closely connected with science, particularly in the Polish context. Why? Firstly, because the focus is currently on the ability to obtain European Union funds from the new 2014-2020 perspective, with the smart specialisation being a prerequisite. The key European Union programme for the years 2014-20 [*HORIZON 2020*] introduces an explicit criterion for financing research projects: Innovation vs. transformation of knowledge into money (focus on results). Whereas, e.g. in Polish science, the promoted projects are those that transform money into knowledge. The results are usually defined through the scale of expenditures, which is absurd. This results in repetitiveness and decreasing originality of the projects, in the dispersion of potential instead of its concentration, often in the ineffective allocation of funds. Therefore, the substantive aspect of smart specialisation seems to be much more important, although hard to accept in full. The concept formulated in 2008 by D. Forey in DG Research has been instantly introduced in the European Union's political strategic documents (e.g. Europe 2020 Strategy, Innovation Union flagship initiative, Digital Agenda for Europe) and developed in the area of cohesion policy (DG Regio, e.g. Regional Policy contributing to smart growth in Europe 2020), which resulted in the preparation of a special publication – Guide to Research and Innovation Strategies for Smart Specialisation [*RIS3Guide*, 2012]. The following quotations from the European Union strategic documents illustrate the smart specialisation concept in various configurations:

- „regions need to redirect funding based on a smart specialisation approach and focus on relative strengths where they can become excellent" [*Innovation Union*, p. 23];
- „Starting in 2010: Member States should considerably improve their use of existing Structural Funds for research & innovation projects (…) implementing smart specialisation strategies" [*Innovation Union*, p. 23];

As we can see, the Gender approach is also not used in implementing documents for the preparation and implementation of RIS based on the SSS.

Based on the above centrally formulated assumptions, it is worth determining: what smart specialisation is and what it is not, and how the smart specialisation identification process should look. Obviously, it is not about preparing a list of research projects, technologies, or sectors selected "from behind a desk". It is an economic transformation

PROCESS effected through the entrepreneurial discovery of all actors (men and women), where **science is the key and the outcomes are structural changes** in the economy, leading to a sudden increase in efficiency and competitiveness in the global market. The entrepreneurial discovery process is not expected to bring about new research projects, but to trigger off structural changes in the economy. Since science is the key to smart specialisation, such structural changes must first take place in science, particularly in the area of applied research. There are regions in Poland that are quite successful in this respect, such as Malopolska, which not only developed its own methodology (compliant with RIS3 guidelines), but also attempts to apply the concept of equality InnoGend to records in the RIS.

3. References to equality in RISs: lessons from selected regions in Poland

Activation opportunities to use women's creativity in the formation and implementation of strategic programmes are mostly determined by institutional conditions in a given country or region. The system transformation that took place in Poland 25 years ago unfortunately did not include the popularization of the equality approach, but it rather meant de-emancipation [Środa, 2014]. The system transformation in the case of women's rights and opportunities to release their creativity is in fact moving in an opposite direction – backwards. Poland has regained its freedom, women have lost it – systematically and consistently. Their presence in the public, opinion-forming sphere is rather weak. Women play a minor, decorative, service role in the media (in political commentary programmes 75% of invited guests are men). Women's issues, such as inequality, care, violence, welfare, education appear quite rarely in the news, especially in comparison to important men's issues such as sport, politics, military, corruption, power. Even though transition has allowed entrepreneurship to develop, only 30% of women are entrepreneurs, most of them are self-employed, and provide services: trade, run B&Bs, cooking, cleaning. Putting forward the thesis that the underutilization of women's creativity causes loss is rather risky in such a climate. It is nevertheless worth closer examination. What does a strategic approach to the participation of women in innovation processes look like in the context of equity regulations, support instruments and women's participation in the preparation and implementation of RIS on a regional level? In this particular case, the available answers are limited to several provinces only, the ones that have recently undertaken such an analysis. They are not exhaustive, but they allow opinions on this topic to be formulated. A number of provinces believe that there is no need to include equity (anti-discrimination) regulations in strategies, since they are already included in the EU regulations, and each application is to be verified according to those rules at the competition level. It does not seem legitimate since many projects are of a so-called key project type, and such projects are carried out outside of competitions, so competition rules do not apply to them.

Six provinces were selected for the analysis of equity regulations: Kujawsko-Pomorskie, Łódzkie, Mazowieckie, Podlaskie, Małopolskie, Pomorskie, Lubuskie. Results of the analysis are presented in Table 1.

TABLE 1.

Diagnosis of the state of equity regulations in RIS in chosen provinces in 2013

Province	Equity regulations: yes/no	Description of equity regulations
Kujawsko-Pomorskie	Yes	An increase in welfare expenses: (53.5% unemployed young women, growth of poverty, lower level of education); elimination of social exclusion of women and men
Łódzkie	No	No regulations
Mazowieckie	Yes	An increase in birth rate, control of job opportunities
Podlaskie	No	No regulations
Małopolskie	New methodology	Scientific research used for the diagnosis of IGIG
Pomorskie	No	No regulations
Lubuskie	Yes	Intervention concerning the problem of depopulation and the outflow of women in productive age from rural areas

Source: Own research based on results of the workshop conducted during the Congress of Women: working group on regional strategies 2014-20.

Only 4 out of 16 provinces (25%) include equity regulations in strategic documents, such as RIS. The diagnosis of the state of equity regulations shows that paragraphs concerning women, their economic position or activities either do not exist or are enigmatically phrased. The intervention applies only to welfare issues. Despite clear EU indications concerning the significance and obligation to use women's specific competences, regional strategic documents do not relate to them either in the general part or in SS.

TABLE 2.

Equity problems in SWOT comparative analysis

Province	Weaknesses / strengths	Opportunities / threats
Kujawsko-Pomorskie	Unemployment, low level of social capital / no	No/No
Łódzkie	No	No/No
Mazowieckie	Low level of women's activity/no	No/No
Podlaskie	No/No	No/No
Małopolskie	Unemployment/education	No/Migration
Pomorskie	No/No	No/No
Lubuskie	Lack of pre-school care institutions/ no	No/No

Source: Own research based on results of the workshop conducted during the Congress of Women: working group on regional strategies 2014-20.

In the SWOT analysis, both strengths and opportunities caused by women's creativity in intellectual and economic sphere are not defined due to the lack of data in available databases. The problem is usually summed up in a general statement about the difficult situations women face.

Undoubtedly, the greatest expectations concerning equity regulations should be addressed to strategic, operational objectives and to activities that constitute the key parts of strategic documents, including the RIS. Based on the objectives and activities presented in the strategies, it could be stated that there are no unambiguously distinct objectives concerning the situation of women, assigned roles that women play in the society and economy, or possibilities to use their potential. This could be explained by a high level of generality present in these strategies that may cause certain difficulties in emphasising women's aspects. Nevertheless, there are distinct paragraphs concerning the elderly and the disabled in almost every strategy, and this solution seems to make sense. Such an approach to different social groups shows the selective treatment of the society. The postulated inclusion of paragraphs concerning gender should not cause any difficulties in the operational part of the strategy.

An active approach to indicator analysis seems to be interesting in the context of ignoring gender aspects in strategic documents (table 3).

TABLE 3.

Indicators for monitoring equity regulations

Province	Equity regulations	Indicators
Kujawsko-Pomorskie	Yes	Unemployment disaggregated by gender Economic inactivity after having a child Life expectancy Sport teams according to disciplines disaggregated by gender
Łódzkie	No	Owners of SMEs Participation in local government Unemployment disaggregated by gender Women and men as decision makers
Mazowieckie	Yes	Employment Entrepreneurship Demands: participation in decision making bodies, in social organisations, organisations with power, intellectual potential
Podlaskie	No	No
Małopolskie	No	Owners of SMEs Participation in local government Unemployment disaggregated by gender Women and men in decision making bodies Women in science
Pomorskie	No	No
Lubuskie	Yes	Indirect

Source: Own research based on results of the workshop conducted during the Congress of Women: working group on regional strategies 2014-20.

In the strategic documents, such as RIS, there is a certain inconsistency in pointing at gender aspects in objectives, priorities and activities, and in indicators for monitoring the implementation of strategies. The indicators are collected from existing databases, not created especially for the implementation of objectives, or activities expressed in strategies. It is therefore necessary to undertake efforts to prepare a regional strategies' implementation monitoring system from the perspective of gender equity regulations and regulations influencing women's issues. This will enable the constant and long-term observation of the process of changes (improvement) concerning the use of women's creativity in regions and on the national level. During the 7th Congress of Women (2014), the first list of necessary amendments to equity regulations in strategic regional documents was put into words (Table 4).

TABLE 4.

Proposals for including equity regulations in region al strategic documents

Province	Proposed equity regulations
Kujawsko-Pomorskie	Adjustment of the public transportation system to women's and men's needs; civic education concerning equal opportunities; small grants for women's NGOs; counteracting discrimination in the workplace; flexible work time (specific) for women and men; quotas for women in science; stipends for women, university care centres for pre-school children; promotion of women's entrepreneurship in rural areas; using women's potential in agriculture and processing industries; e-commerce for women; improvement of women's safety; diversity management and gender policy; promotion of outstanding women; tourist route "Tracing Women in Kujawsko-Pomorskie province;"
Łódzkie	Record in SWOT/appeal for non-discrimination and equality between men and women; in strategic objectives: tax allowances and rent incentives for women's start-ups; search for unique professionals – women and men – to support the revitalisation of Łódź; creation of conditions for increasing women's participation in the labour market; fighting the gender wage gap; social activation of women and men; creation of job positions for women and men; educational policy that meets women's and men's needs; policy for the social inclusion of women and men;
Mazowieckie	Instruments for dissemination of knowledge concerning women's and men's intellectual and economic potential;
Podlaskie	Description and dissemination of knowledge concerning the situation of women in the region; tools and infrastructure for women returning to work after maternity leave; special services for aging women and men; indicators monitoring the situation of single parents;
Pomorskie	Monitoring 50+ women in the labour market, support for the growth of participation of 50+ women in the labour market; assessment of women's social and economic participation and instruments supporting such participation; assessment of women's underutilized potential; gender education; monitoring of cancer incidents among women, introduction of counteracting factors;
Lubuskie	Sectoral analysis of women's participation in economic activity; development of gender-sensitive databases; analysis of the structure of education on each level and specialisation by gender; preparation and implementation of indicators assessing the implementation of the strategy taking gender into consideration.

Source: Own research based on results of the workshop conducted during the Congress of Women: working group on regional strategies 2014-20.

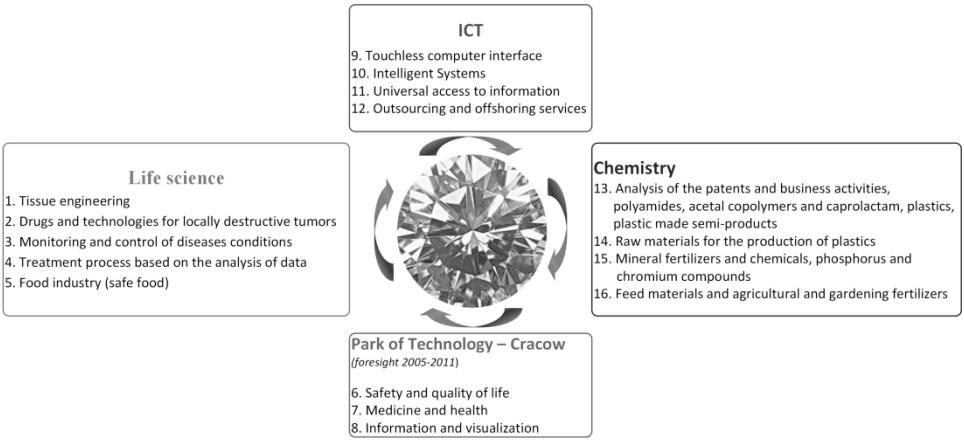
Studies of proposals for the inclusion of equity regulations in regional strategic documents show that such proposals are selective, random, not systemic, and touch social everyday problems, economic issues concerning entrepreneurship, and finally political problems to a different degree. Such regulations are far from thematic and directly present the need to use women's and men's creative potential in innovative activity, however this is mentioned in an indirect way. It is therefore necessary to undertake steps to prepare and implement standardised general rules (methods) allowing the significance of the specificity arising from gender in creative activities leading to the development of innovations in regions or on the national level to be captured. And this should be included in the strategic documents, in RIS in particular.

4. The use of the "InnoGend" concept to modify records in the RIS Malopolska

Although the Malopolska province is fully prepared to implement the RIS according to the so-called SSS diamond (Chart 1), equity regulations are of a similar fragmentary nature as in other provinces. Nevertheless, efforts to improve it have fund content grounds.

CHART 1.

Malopolska SSS Diamond



Source: Own analysis.

Using opportunities provided by the EU programmes promoting an increase in women's engagement in the process of innovation, the InnoGend[3] concept is put forward. In this concept, the significant role of women's and men's specific features

[3] Developed in the framework of the Norwegian Research Grant entitled: Innovation Gender as a New Source of Progress, Jagiellonian University 2013-2016.

in innovative activities in shown in the Integrated Gender Innovation Genome. By using relations written in this genome, it will be possible to measure the roles that women and men play in particular processes of innovation, and the equity regulations included in the RIS should be adjusted to the information provided by the genome. Meanwhile, in the strategic documents preparation process, the gender structure has been as follows:

1. Strategic expert: 100%W
2. Expert team: 25% W; 75%M
3. Operational team: 25%W; 75%M
4. Consultative team:
   - 4.1. Malopolska Council for Innovation 14%W;86%M
   - 4.2. Economic Council 100%M
   - 4.3. Council for Information Society: 0.07%W; 99.03%M
   - 4.4. Common Council of Local and Economic Authorities in Malopolska: 0.06%W; 99.04%M

The role of women in the preparation and the RIS and other strategic documents for Malopolska has been rather executive, and in a minimal degree consultative, expert or managing.

Meanwhile, the observation of many innovation exercises shows that optimal innovation occurs when there is an equal mix of men and women using a systemic process [SIT, 2011]. When a predominately male group tries to innovate, the results are less impressive, and when a predominately female group tries to innovate, the results are less impressive. Put them together, however, and the results are amazing. Research in this area may have some suggestions why [Millward, Freeman, 2002]. The essence of the research is that, while men and women are equally innovative, their gender role within the context of an organisation can affect how they are perceived and how they behave when innovating and sharing ideas. Men are perceived as more innovative and risk-taking, and women are perceived as more adaptive and risk-adverse. Thus, gender roles may interact with the role of the manager to inhibit (in the case of women) or facilitate (in the case of men) the likelihood of innovative behaviour. The results of the research suggest that innovative solutions were attributed more often to a male than a female manager, whereas adaptive solutions were attributed more often to a female than a male manager. Men are expected to take more risks when innovating and sharing ideas. Failure is less damaging to men because that's what's expected of them. Women are expected to be less risky, and this appears to limit or constrain both their degree of innovation and their willingness to share it. Failure is more damaging for women so they behave more adaptively in innovation exercises. There is both a negative and a positive side to this. On the one hand, innovation workshops need a process to assure that women feel they can innovate "more" and share those ideas with the group. If, as the research suggests, women are more likely to hold back, then the facilitation approach has to break through it. Otherwise, one can lose the inherent value of the (equal) innovation talent they bring to the table. On the positive side, these differences can be beneficial. This more adaptive behaviour in women and more risk-taking behaviour in men provides a certain balance or harmony during innovation, is a complementary effect that seems to yield better results. This means that each partner holds the other accountable for ideas that are, at the same

time, novel but adoptable. Working in pairs, men and women also do a better job of expressing jointly-developed new ideas that may help overcome risks that women may be feeling. Workshop processes that pair men and women up to take advantage of this are going to be more fruitful and differential role expectations do not have an impact on the production of actual solutions. The findings are discussed for their potential to complement existing research on role expectations and innovation as well as their implications for the development of a new research agenda. In this project the equal role of gender in the innovation process is called Innovative Gender. In simplest terms gender is a concept that refers to the social differences between women and men that have been learned, are changeable over time and have wide variations both within and between cultures [EC, 1998]. Based on the innovation genome model [Degraff, Quin, 2007], the Integrated Genome of Innovative Gender (IGIG) has been built and it takes into account the importance of all members of the innovative activity of women and men, so the issue of gender is accounted for (Table 5, Chart 2). A starting point for the InnoGend concept and research may be the construction of four or five (or more) dedicated matrixes, (Gender patterns) containing information (variables) describing a given area, taking gender issue into account (Table 5) The matrix contains the stages of the innovation process and characteristics of Gender in the various stages of the process. Pilot research is being conducted at the moment and empty places in the matrix are to be filled in. The data necessary to complete Table 5 are defined in Chart 2. They are currently being collected and selected.

TABLE 5.

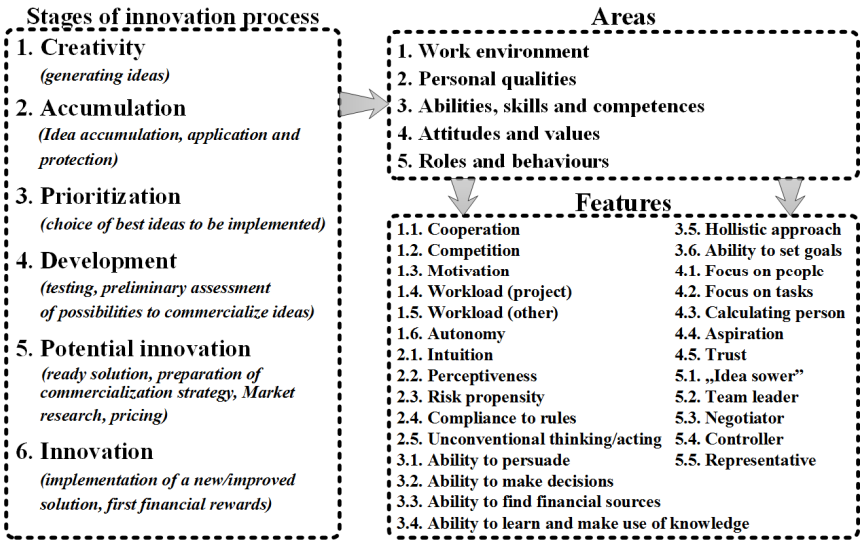
Integrated (Gender) Innovation Matrix

Innovation process stages/gender description	Idea generation/ creativity	Idea management/ accumulation	Selection prioritisation	Idea development	Project management/ potential innovation	Implementation and diffusion/ innovation
Work environment						
Personal qualities						
Abilities, skills and competence						
Attitudes and values						
Roles and behaviours						

Source: Own research.

CHART 2.

Detailed description of the content of the Integrated (Gender) Innovation Matrix

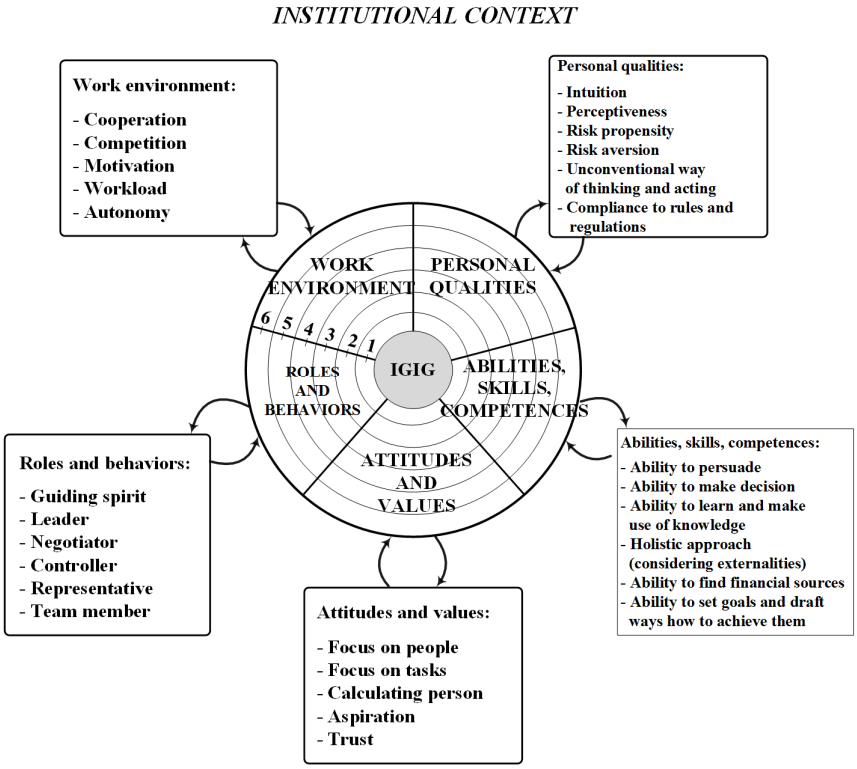


Source: Own work.

Experience has proven that the key to creating value in the innovation genome model is one of its elements, namely collaboration. The essence of collaboration between men and women as a team has been lost in economic, political, and social life and replaced with subordination based on submission. Feminists calling for parity will not change this. This can only affect the structure of work or of political or social groups; but a group is not equivalent to a team. A group, even with equal representation of men and women, is still based on functional subordination, while a heterogeneous team accumulates optimum potential ensuring the simultaneous effect of scale and synergy. Innovative Gender grants equality of measures, opportunities, and situations, falling within the scope of the innovation genom model to men and women. It is assumed, that the issue of equality of gender in general, manifested as equal accessibility of education, equal rights, equal pay, equal access to the labour market, equal access to vocational training, equal promotion opportunities in employment, equal social benefits and rights, equality in the performance of social and political roles, equality as regards employment security, equal right to maternity leave and unpaid extended post-maternity leave in a given social and economic system is already maintained; any gaps in this respect may only be institutionally neutralised There is one more issue to discuss – evaluation of the deployment of "gender resources" in the process of innovation, and its impact on the outcomes (This is due to the political-legal context – see Chart 3).

CHART 3.

Integrated (Gender) Innovation Genom (IGIG)



Source: Own analysis.

Attention should be paid to the multi-dimensional differences stemming from gender, which should be perceived as a totally positive element, because they are the source of synergy resulting from the collaboration of research or business teams in the process of innovation. Usually, research focusing on differences is used to point to various forms of gender discrimination; therefore, there is no place for it in this approach. The InnGend concept is more about process changes which are created, implemented, and disseminated by various teams made up of collaborating men and women from various social groups, engaged in a team as professionals (scientists, researchers, engineers, etc.) or quasi-professionals – process participants who are community workers creating changes and disseminating their outcomes, or politicians providing institutional support for such processes. On the basis of the IGIG results (gaps) one will be able to determine the type and location of records equality in strategic documents, whereas the central point of InnoGend is creating value through people (men and women) in all possible areas simultaneously, based on the following formula [Degraff, Quin 2007, pp. 10-11]:

PEOPLE + PRACTICE = PURPOSE

Where:

- purpose – outcomes people (men and women) want to achieve,
- practice – any activity and value perceived as important by people (men and women) involved in pursuing the purpose
- people – all people (men and women) involved in activities aimed at achieving the purpose

5. Conclusions

Based on the study it may be pointed out that women are still poorly represented in the preparation of strategic documents in the field of innovation. The more detailed research, analysis of decision-making powers and undertaken activities are needed in order to solve the puzzle why so few women are involved in such work. Uneven representation of women occurs regularly both in the preparation of strategic documents relating innovativeness, and the innovation process, in each of its phases.

Work on RIS was an inspiration for the preparation of a new methodology[4] for evaluating the role of women and men in the innovation process (InnoGend). Research shows that these roles are determined by many factors, external (institutional) and internal, which can be classified by creating a model referred to as Integrated Genome of Innovative Gender.

The conducted pilot studies show (Chart 4), however, that women prefer their participation in the implementation of organizational innovations (so called soft), while men prefer to invest their potential in product innovations (so called hard).

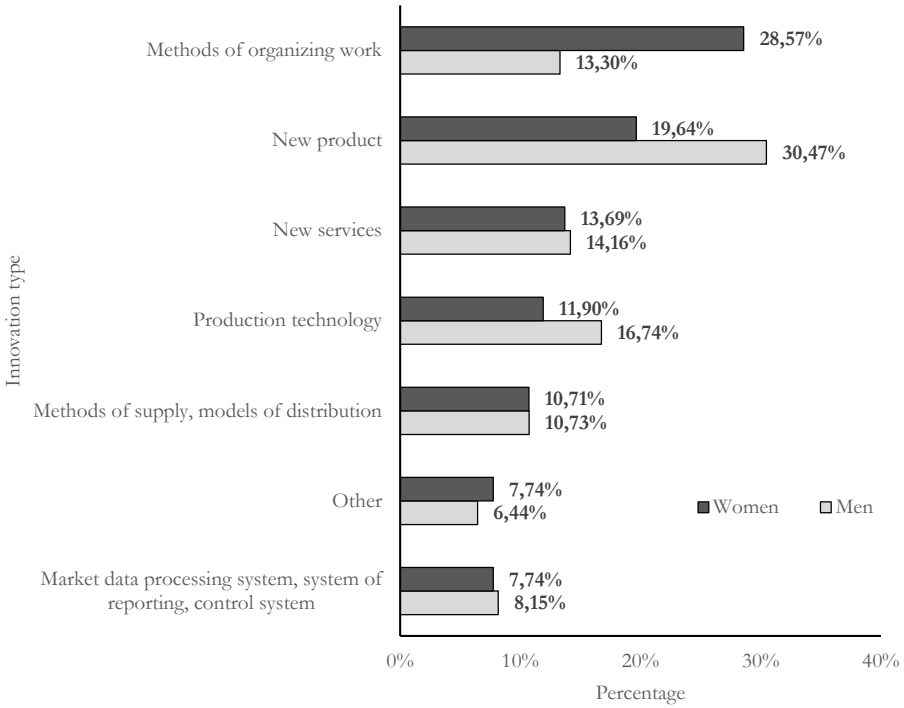
The InnoGend concept in searching for specific roles and actions by women and men in innovative activities may bring some new research and practical effects, such as:

- new approach to the identification of commonalities and differences of gender related innovation activities, (barriers, gaps, opportunities, effects),
- new methodology in research on gender related activities,
- deeper interpretation of the political, macroeconomic and institutional conditions for triggering innovation activity dependent on gender,
- construction of an innovative gender index.

[4] This methodology has been developed in a research project titled: Innovative Gender as a New Source of Progress conducted by the Department of Economics and Innovation Jagiellonian University in Krakow

CHART 4.

Women and men as managers of the sections or teams involved in development of specific type of innovations in the investigated units



Source: Own work.

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Janusz OLEARNIK, Mirosława PLUTA-OLEARNIK[1]

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ENTREPRENEURIAL UNIVERSITY – FROM IDEAS TO REALITY

Summary

The aim of this study is to formulate and highlight the thesis on reasonability and capability of applying such attitudes and pursuing such activities in the practical operation of institutions of higher education that reflect the idea of the entrepreneurial university which has become prominent nowadays. The idea is described in brief and its present status is indicated here. The authors are seeking conditions for the practical implementation of this idea. They formulate four attributes of the entrepreneurial university, naming them economic, market, innovative and managerial orientations. They point to specific criteria of identifying each of the orientations. They present the general assessment of entrepreneurship of Polish institutions of higher education. Their conclusions highlight the most topical conditions for implementing the idea of entrepreneurial university, such as: building the economic strength and market position of the university, developing relations with the socioeconomic environment, internationalisation and innovativeness. The authors give support to the idea of the entrepreneurial university but – by examining the Polish reality – they notice the need for actions in the sphere of law, which regulates the university's capabilities to act, and point to the need for entrepreneurship-oriented transformations of lawyers and university management staff's awareness.

Key words: academic entrepreneurship, entrepreneurial university, entrepreneurial attributes.

1. Introduction

The aim of this study is to formulate and highlight the thesis on reasonability and capability of applying such attitudes and pursuing such activities in the practical operation of institutions of higher education that reflect the idea of the entrepreneurial university which has become prominent nowadays. We present a collection of our assessments and reflections based on active observation of the issues in question relying on: literature review, own empirical research on entrepreneurship of universities, experience gained while participating in processes involved in managing a Polish institution of higher education, and contacts within the academia.

We are deeply convinced that it is worth paying attention to such academic entrepreneurship that regards the university as a whole, as a separate entity and a market

[1] Prof. dr hab. Janusz Olearnik – Department of Tourism, University School of Physical Education in Wroclaw, e-mail: janusz@olearnik.pl. Prof. dr hab. Mirosława Pluta-Olearnik – Department of Fundamentals of Marketing, Wroclaw University of Economics, e-mail: miroslawa.pluta-olearnik@ue.wroc.pl

player, as well as to the university's management, funding, marketing and development processes. This approach is based on a modern attitude to institutions of higher education, the essence of which is expanding the university model applicable to date, that is one relying on the superior role of education and scientific research, by the element of entrepreneurship defined as active efficiency- and market-oriented actions of the institution of higher education. The entrepreneurial university is also called the third generation university, the idea of which is to tie the university to its social, including business, environment in a tight and comprehensive manner.

2. The idea behind the entrepreneurial university

The idea of the entrepreneurial university occurred in Europe relatively recently, that is at the end of the 20th century. It was outlined in the famous work by B. R. Clark *Creating Entrepreneurial Universities: Organisational Pathways of Transition* [Clark, 1998]. The point of departure was the need for evolution of the European university culture, transition from the traditional culture, where the sense of the university's operation is knowledge creation and transfer in the course of the teaching and scientific work, to the entrepreneurial culture, which is closer to the present day demands. Clark formulated five elementary principles for organisational changes in universities: the strengthened steering core, the extended development periphery, the diversified funding base, the stimulated academic heartland, and the integrated entrepreneurial culture.

Later works by this author [Clark, 2004], and in particular by H. Etzkowitz [2013], present two theses. One provides for a perceivable spread and popularisation of the very idea of the entrepreneurial university among the academia. The other thesis highlights the enlarged approach to academic entrepreneurship, which consists in the university's entrepreneurship manifesting itself in its impact on the regional socioeconomic environment, including establishment of and support for enterprises, alongside respect for management, financial, market principles, including commercialisation of scientific achievements. It is worth invoking the triple helix model here, as it permits description of interactions between three spheres: university – industry – government [Etzkowitz, Leydesdorff, 1999]. According to this model, universities defined also as "human capital suppliers", "repositories of entrepreneurship" and "sources of innovative thought" are a significant driver of the knowledge economy growth. In the Polish literature, the triple helix concept is known also under the name "a strategic triangle" [Kukliński, 2003, pp. 55-61]. A separate thread in the idea behind the entrepreneurial university is the significance and place of innovation as a factor determining the position of universities in their relations with the environment and as part of the triple helix [Etzkowitz, 2004].

Nowadays, the idea of the entrepreneurial university is still at the stage of creation and popularisation, and at the same time it is gaining in popularity and interest among numerous researchers. An example is a series of European conferences dedicated to academic entrepreneurship; these are the so-called FINPIN conferences, initiated in Finland (2006 Universities Entrepreneurship Incubating Processes; 2008 Promoting

Entrepreneurship by Universities; 2010 Innovation and Entrepreneurship in Universities), and later held in other countries (2012 Munster, Germany – Entrepreneurial Universities; 2014 Madrid, Spain – Good Practice Event on Entrepreneurial Universities).

Admittedly, the idea of the entrepreneurial university faces resistance on the part of some members of the academia, which is illustrated by Etzkowitz [2000], and opponents perceive this idea as a threat to the traditional university model, which gives prominence to values such as: community of scholars, tradition, liberty, striving for truth, education of the society. Yet – with all due respect to those values – the contemporary considerations and their high changeability encourage more and more researchers to formulate a new university model, including to determine conditions of shifting from the idea to its particular application; a handbook was even written on the subject [*Handbook of the Entrepreneurial University*, 2015].

3. Contemporary challenges posed to universities

Traditional roles of universities: education and scientific research, are still applicable and no one wants to change them. However, the conditions in which the roles are performed are changing.

Contradictory trends are noticeable with respect to education. On the one hand, the phenomenon of popularising education and developing its forms is visible in Europe. Numerous new institutions of higher education are being established, the idea of life-long learning is developing, university education for the elderly is in operation (these are "universities of the third age" in Poland). Universities are an important part of the knowledge society system, or in other words – the knowledge-based economy. On the other hand, demographic trends that restrict inflow of university candidates are emerging. Mass education is often in conflict with education quality, which reduces capabilities of elite universities, which produce leaders. These are not positive trends for universities, yet they need to be treated as a challenge, as a call for changes to adapt universities to the trends.

The today's scientific world is becoming more and more specialised, increasingly narrower scientific specialties, which require in-depth knowledge and scientific penetration, are emerging. This refers to exact sciences in particular, but also to medicine, informatics, and even social sciences. The economy is becoming more and more dominated by information technologies, it needs graduates of the new generation, different than those who graduated even a few years ago. The emergent question is whether universities can rise also to this challenge.

University funding has still been a topical issue. In Europe, despite various funding models, financial aid from state budgets is the prevailing form. Reducing the share of state subsidies would benefit the budgets and the universities, at the same time supporting independence of the latter. The phenomenon of such a reduction is actually in progress, assuming various forms. The examples provided by Clark concern restructuring the sources of university funding under the influence of model changes. In the five examined universities, the share of direct state subsidies decreased at:

Warwick (the UK) from 69 to 38 per cent, Twente (the Netherlands) from 93 to 76 per cent, and Strathclyde (the UK) from 75 to 45 per cent (during the period 1970-95); Chalmers University of Technology in Gothenburg (Sweden) from 67 to 55 per cent in the period 1980-95, and Joensuu (Finland) from 96 to 66 per cent. At those universities, the share of other streams increased: subsidies from research councils and agencies, donations, royalties from licences, student fees, income from contracts, etc. [Clark, 1998]. The trend demonstrated here was noticed some years ago, but the today's experiences confirm it, which is visible in the report of The Economist *The whole world is going to university* (of 28 March 2015).

Universities cannot be indifferent to market challenges. The supranational educational market is forming and developing, education and scientific research are becoming an object of market turnover. There are still many countries which ensure free education to their citizens; it is even stipulated in the Polish Constitution. In spite of that, commercialised forms of university activities are also developing there. Knowledge is becoming a product, whether it is in the form of education or transfer of innovative solutions. This means that universities must assume the role of market entities to a large extent, which requires changes not only in the philosophy of their operation but also application of certain solutions in management, marketing, finance, development policy.

4. Attributes of the entrepreneurial university

Hence, the need to become more familiar with the issue of university entrepreneurship, to formulate criteria for its assessment, research and formation methods. We present here four entrepreneurship attributes of the university [Olearnik, 2013].

It is assumed that an entrepreneurial institution of higher education is one which demonstrates each of the four presented attributes in its determined goals and rules of action as well as in the practice of its operation and development. The degree (intensity) of a given entrepreneurship attribute may be different, it may change, which provides bases for assessments and conclusions with respect to entrepreneurship of a given university and its distance to the models adopted as standards.

The first attribute is the **economic orientation**, or in the strict sense – the economic and financial orientation. It is reflected in assuming economic efficiency as one of the major goals of the activities pursued by the institution of higher education. While the system based exclusively on central budgeting of the university assumed spending the funds allocated for a given period as the only economic efficiency criterion pursuant to laws, the attribute of economic orientation presented here brings the following categories to the forefront: revenue, costs, financial results. These categories and the accompanying indicators should be crucial components in planning, monitoring, reviewing and assessing before, during and after closing a given settlement period.

Economic and commercial orientations need to be differentiated here. The former is manifested also in the cost policy of the university spending budget funds, since (planned, incurred, restructured, etc.) costs are a strictly economic category. This means that universities relying on funding from public resources also can or even should be

characterised by the economic orientation. On the contrary, the commercial orientation refers only to activities consisting in service provision against payment, and the basic criterion is sales economic effectiveness and efficiency. This means that any commercial activity has a full economic dimension, while the economic orientation is considerably broader than the commercial approach.

The second entrepreneurship attribute of institutions of higher education is the **market orientation**. This means that the market or, more specifically, the market mechanism is adopted as a significant criterion for current and developmental decisions. There are three markets that are essential for the institution of higher education: the labour market – as the ultimate place of employment and a collection of requirements for graduates, but also as a source of staff acquisition; the educational service market – as a space for inevitable competition with other entities, with the competition taking place on three major planes: offers, prices and the brand (reputation) of the university; the scientific research and innovative product market – as a place for seeking addressees of and partners for the scientific research conducted by institutions of higher education. University activities on each of the three markets mean the need for bilateral communication, market research and monitoring, as well as broadly defined marketing actions. Many institutions of higher education have marketing units within their structures, yet their actions are frequently limited e.g. to promotion, as a result of which they are unable to perform multilateral functions building the university's market position.

The third attribute is the **innovative orientation**, as there is no entrepreneurship without innovativeness. Institutions of higher education are a peculiar mixture of approaches. On the one hand, the university is a natural habitat for canons of knowledge: traditional, permanent, universal, transferred to next generations of students. The space for innovations is smaller here, unless it is a dynamic developing field of knowledge. On the other hand, the institution of higher education is a community of personages with highest qualifications and therefore there is no better place to expect creativity and innovativeness than that. We believe that the university needs to be comprehensively innovative, where comprehensiveness means creating innovations in multiple areas: knowledge creation and transfer, scientific investigations, formation of relations with the environment, management of all processes at the university.

The fourth entrepreneurship attribute is the **managerial orientation**. It involves the necessity to develop such university management systems where, apart from the academic approach (based on characteristics such as: the social mission of the university, traditional principles, independence of investigations, academic community), the managerial approach exists relying on business rules and modern management methods and techniques applied in enterprises. These two approaches must create the university management practice jointly – none of them can be either excluded or strongly dominant.

Among the entrepreneurship attributes presented above, the following characteristics of institutions of higher education need to be sought: assumptions, goals, rules of action, attitudes of people and university authorities, internal laws, organisations, achievements, good practices, and other manifestations of the presence or shortage of entrepreneurship in the university's operation.

5. Specific characteristics of the entrepreneurial orientation of the university

Certain characteristics of the institution of higher education can be ascribed to each of the four entrepreneurship attributes described above. The occurrence of such characteristics can be treated as a manifestation of the entrepreneurial orientation of a given institution of higher education, with a proper distance to the qualitative and often subjective nature of such assessments. Sets of characteristics typical of a given orientation are presented below [*Przedsiębiorcza uczelnia*…, 2009].

1. The economic orientation as an entrepreneurship attribute is fulfilled when the university demonstrates the following characteristics:
   - The university's mission or other essential documents encompass the declarative orientation towards achieving economic efficiency.
   - There are efficiency-oriented goals and/or actions in the strategy of the institution of higher education.
   - Sources of funding the ongoing activities and development of the university are diversified.
   - The institution of higher education discloses a positive economic result in its annual financial statements.
   - The balance sheet value of the university's assets demonstrates an increasing trend.
2. The market orientation as an entrepreneurship attribute is fulfilled when the university demonstrates the following characteristics:
   - The institution of higher education investigates and monitors the further path of its graduates.
   - The institution of higher education maintains relations with employers (councils, conventions, the university's presence in professional organisations, lectures by managers and specialists regarding the economic practice).
   - University curricula are flexible and allow for changeable conditions on the labour market, and new majors are established under the influence of labour market trends.
   - The institution of higher education seeks or has partners in the area of economic practice in carrying out its scientific research.
   - The university perfectly knows the competitive environment and monitors it on an ongoing basis.
   - The institution of higher education uses marketing tools for creating and sharing its offer as well as for building relations with entities within the environment.
3. The innovative orientation as an entrepreneurship attribute is fulfilled when the university demonstrates the following characteristics:
   - The institution of higher education is active in creating new undertakings and syllabi.

- The institution of higher education organises individualised (ordered) teaching projects – for a given recipient, normally a business one.
- The university prepares and/or implements investment projects on a large scale: purchasing real properties, constructing new or expanding the existing buildings, upgrading equipment.
- The institution of higher education ensures a high quality and development with respect to technical support for teaching and scientific research.
- There is the advantage of the university's internationalisation, in particular development of international contacts and growth in the number of foreign partners.

4. The managerial orientation as an entrepreneurship attribute is fulfilled when the university demonstrates the following characteristics:
   - There is an efficient finance management system in the institution of higher education: acquiring sources of funding, planning and analysing revenue, costs and results, cooperating with financial institutions, acquiring external funding.
   - The institution of higher education pursues systemic marketing activities: marketing planning, market research, operations in promotion and public relations, and a marketing unit operates within the university's structure.
   - There is a system that motivates staff to innovative and efficiency-oriented actions in place.
   - A quality assurance system functions in the university.
   - The institution of higher education has a modern internal and external communication system.

6. Entrepreneurship of Polish universities

Polish institutions of higher education of the present day do not display entrepreneurial characteristics to a satisfying degree. This is probably an effect of the fact that, as recently as 25 years ago, the entire field of Polish higher education was a non-profit area, where universities operated as a component of the system of public services funded from the state budget in whole, and categories such as economic calculation, market and marketing, modern management, entrepreneurship were completely unfamiliar to universities. The 1990s brought commercialisation of a part of the higher education sector in Poland. Simultaneously, the need for market reorientation and a considerably deeper economic reflection occurred in institutions of higher education. The issue of university entrepreneurship understood as the formula of its activities subordinate to economic goals and market situation based on innovativeness and development aspirations became topical. Scarce scientific research [*Przedsiębiorcza uczelnia*…, 2009; *Przedsiębiorczość akademicka*…, 2009; *Uniwersytet trzeciej generacji*…, 2013] on university entrepreneurship attempted to explain its considerations, regularities and trends, provide scientific support for activities pursued by institutions of higher education. However, despite the scientific explorations and the resulting recommendations, entrepreneurship of universities in

Poland has still been an unfulfilled idea, a vision which does not assume the form of practical solutions and particular attitudes and achievements, and which does not get close to being popularised.

When observing the operation of Polish institutions of higher education from the angle of entrepreneurship canons, it needs to be stated that they are normally oriented "inwards", where the following issues are among ones that are significant for them: the teaching process, academic promotions, material base, new majors, number of students, while neglecting external relations, in particular with three segments: graduates, competitive environment and business environment [*Przedsiębiorcza uczelnia*…, 2009].

Universities seek relations with their graduates too slowly and to an insufficient extent. We are pointing to universities' engagement in investigating and monitoring the further path of their graduates as one of important criteria of their entrepreneurship. A relation with graduates always strengthens the university's position; a strong relation with the best graduates can be a source of significant strength for the institution of higher education [Nowaczyk, Sobolewski, 2011; Krajewska-Smardz, 2012].

Maintaining relations with employers is one of the weakest points of Polish institutions of higher education although it should be treated as extending relations between the university and the labour market. In broad terms, employers are understood here as entities of the economy, administration, public life, which are interested in university graduates, the process of their education, preparation for a job.

A handicap of Polish institutions of higher education is restricted and undiversified sources of funding. There are two types of universities that operate in parallel in the Polish higher education system. One is public universities, which are called so due to their sources of funding – public funds, which come from the state budget and are allocated by the government, are definitely the dominant source of funding for the institutions of higher education, and supervision over such universities is exercised by the state through a competent minister. Such universities – given the number of students in 2014 – constitute 75% of Polish higher education [*Szkoły wyższe i ich finanse*…, 2015, p. 57]. The other type is private universities, which have been established in Poland since the beginning of the 1990s and are funded mainly from student fees with an insignificant share of subsidies granted by the state budget (for the purpose of student scholarships, scientific research for the best universities). The differences between the two types of universities in terms of entrepreneurial orientation need to be noticed. The orientation is definitely more visible in private institutions of higher education, which have been operating according to market rules and economic efficiency criteria from the very beginning.

7. Conclusions

The entrepreneurial university should be interested in building its good position in the academia as well as on the educational and scientific market. At the same time, the university – apart from striving for achievement of the social mission – should build its economic strength by using the resources held and external considerations.

An important characteristic of the entrepreneurial university is the proper system of its relations with the socioeconomic environment. The university's environment includes: individuals, groups of people, other universities, social institutions, administrative institutions, and market entities having various relations with the institution of higher education. An important part of the university's environment is its beneficiaries, that is individuals and entities interested in diverse benefits brought to them by good operation of the university. It is necessary to identify individual entities within this environment, to form the desired relations between the institution of higher education and such entities, to maintain and develop the relations – all for the purpose of creating the position of the university as an active and important member of various environments, and as a market entity.

A characteristic of the entrepreneurial orientation of universities is internationalisation [Pluta-Olearnik, 2012]. For large universities with a long tradition, it is a natural advantage. However, for institutions of higher education in the countries of the so-called new European Union or developing countries it is a fundamental criterion. Internationalisation of the university is perceived there as its developing capability of cooperation with entities from other countries. The measure of success is achievements such as: the number of international contracts concluded, the number of students and staff participating in the international exchange, the amount of funds allocated for undertakings from this area, the number of visiting fellows and foreign students, the number of international conferences organised.

A significant advantage of the entrepreneurial university is broadly defined innovativeness. It is a separate area which requires analyses and explanations. Questions about criteria for the university's innovativeness should be answered, assessment and comparison systems should be developed, self-assessment with this respect should be enabled to universities, and directions of actions for this entrepreneurship attribute should be identified. We wish to strongly emphasise here the need for innovativeness among individuals, teams and whole universities, to oppose to the views claiming that the university is strong only through tradition and already accumulated knowledge, to highlight the great significance of innovativeness in the context of entrepreneurship and development opportunities for universities.

Researchers and propagators of the idea of the entrepreneurial university invoked in this paper represent the global perspective, relying mainly on American and British experiences. We share their opinions, give support to the idea of third generation universities. However, we look at the issue from the position of Poland as a country where the economy, social processes, educational systems, including universities, have still been undergoing major transformations. On the one hand, we notice the continuing discussion signalling a slow approval to the idea [Kozłowski, 2001; Gorzelak, 2009; *Przedsiębiorcza uczelnia*…, 2009; *Uniwersytet trzeciej generacji*…, 2013], which needs to be considered success of its creators. On the other hand, our research shows that it will be neither easy nor quick to implement this idea and popularise it in the operating practice of Polish universities. Polish institutions of higher education are changing but the scale of the changes towards the entrepreneurial university model is insufficient. The changes need to be intensified in two directions. One is the reform of the centrally codified law,

which is an extremely strong determinant in Poland, and at times also a restriction to the activities pursued by institutions of higher education. The other direction is transformations in the consciousness and attitudes of the university's employees and management staff, liberation from the patterns formed over many years, bold exit from the "ivory tower" towards a modern entrepreneurial university that is open to the external environment.

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Tadeusz TRUSKOLASKI, Kamil WALIGÓRA[1]

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LOCAL ASPECTS OF THE TRIPLE HELIX MODEL ON THE EXAMPLE OF BIAŁYSTOK

Summary

The cooperation of the three sectors included in the Triple Helix (TH), i.e. science, business and public administration is carried out in varied ways. The course of the relationship is not only affected by the sectors themselves but also by factors specific to the environment in which they operate.

The article focuses on the local aspects of the TH model – actors who create it and give it a specific, individualized dimension. At the beginning of deliberations, the authors hypothesized that the formation of Białystok Science and Technology Park contributed to the intensification of cooperation between the three sectors in the city of Białystok and the incubation of new innovative enterprises. The aim of the study was to determine the local TH model parameters in the City of Białystok and evaluate the potential of individual actors.

In Białystok, public administration has highest potential within the local TH model. Due to the relatively high degree of integration and concentration of authority in the city it is much easier to carry out long-term innovation policy. The basic problem of business and science turns out to be a low degree of concentration, which hinders the diffusion of knowledge and reduces competitiveness.

In Białystok LGU is the moderator of cooperation between the three sectors – there is a etatistic model. The current local government intervention is supposed to lead to the independence of the two other spheres, through their innovation and increase in competitiveness.

Key words: Triple Helix, public administartion, etatistic model, innovation, local development, Poland

1. Introduction

The Triple Helix model was built relatively recently, about three decades ago. Vestigial elements (fragments of old concepts and approaches to innovation and the coexistence of different spheres of economic reality) used in the model created by H. Etzkowitz and L. Leydesdorff should be sought much earlier, e.g. in the works of A. Marshall [1920] or J. A. Schumpeter [1942], that is, in the first half of the twentieth century. However, this is only the work of C. U. Lowe [1982], J. Sabato [1975] and M. Mackenzi [1982] along with the economic changes in the world (associated inter alia with the transition of many developed countries from economies based on industry to economies

[1] Dr hab. Tadeusz Truskolaski – Wydział Ekonomii i Zarządzania, Uniwersytet w Białymstoku, e-mail: tadeusz.truskolaski@post.pl. Mgr Kamil Waligóra – Wydział Ekonomii i Zarządzania, Uniwersytet w Białymstoku, e-mail: kamilwaligora@tlen.pl.

in which the key role is played by knowledge) that triggered the need to examine, define and specify the new ways of reality functioning.

The Triple Helix model includes both institutional factors and infrastructure that enable the development and uptake of innovations. At the local level it leads, inter alia, to the improvement in the dynamics of urban development. The relationship between factors and actors is subject to change. From the two entities relationship (science and bussienes e.g. research center – company) it transforms into a relationship of three (with public administration). Today, public authority is becoming an important element of the local innovation system.

So far, the Triple Helix model (TH) in Poland has been discussed primarily at the national level, but progressive decentralization, more and more decision-making autonomy of local government units (LGUs) is increasingly making it advisable to analyze the cooperation between science, business and public administration in particular urban centers [electronic document, access mode: https://www.kul.pl/files/42/Decentralizacja.pdf, date of access (4/12/2015)]. In the twenty-first century power (understood as a real opportunity to decide) is transferred to ever lower levels (authorities) of public administration. This leads to the formation and development of a diverse and highly individualized varieties of model of cooperation between the three sectors [Rodrigues, Melo, 2013, pp. 1675-1687].

Innovation has become a key factor in determining the development and creation of a knowledge-based economy, a competitive economy. The most effective way to create an innovative economy seems to be the effective use of scientific achievements by businesses [Ciborowski, 2009, pp. 279-280]. Local innovation is increasingly being driven by local authorities. The role of government is not limited to mediation between science and business, but also relates to the development of innovation policy, provision of tools and instruments for supporting innovation [Palma, Peña Aguilar, Valencia Pérez, Lamadrid, 2011]. LGUs take action to improve the pace of integration of business and science as well as to accelerate the flow of knowledge between them.

The Triple Helix model describes the innovation as a result of cooperation between the three sectors. It manifests itself as a set of specific, flexible and universal connections between enterprises, research institutions and the public sector [Etzkowitz, Ranga, 2010, p. 2]. At the beginning of deliberations the authors hypothesized that the formation of Białystok Science and Technology Park contributed to the intensification of cooperation between the three sectors in the city of Białystok and the incubation of new innovative enterprises. This article aims to identify and evaluate current activities of different actors, and above all, place them on the local economic scene and determine their relationships. The authors will carry out inference on the basis of available local statistics, which will determine the specificity of the Triple Helix model in the city of Białystok. During the study, the authors conducted an ex post analysis of the activity and development pace of the three sectors as well as presented their current structure according to their social, legal and inner potential.

The conducted study had mainly cognitive objectives. It made it possible to deepen knowledge of the basics of shaping and developing a network of cooperation within the Triple Helix in Białystok. It should be noted that the proper use of the Triple Helix,

e.g. through careful coordination of cooperation, can enable synergy which ensures the development of innovation and creates a knowledge-based economy.

Searching for the causes of increased interest in innovation, growing global competition – not only between parties operating on the market, but between whole countries (markets) – should be pointed out [*Nierówności społeczne*…, 2004, p. 255]. The growth of India and China has led to economic weakening of competitive positions of Europe and the US. This has forced the latter to take action that will compete with new players on the global level. Innovation is competitiveness and the possibility of its creation an advantage. However, it is not easy to achieve and requires the integration of work and activities of different interest groups.

2. Introduction to the subject – Triple Helix at the local level

The growing importance of science and knowledge in the twentieth century, their use not only to describe reality but also in terms of the possibility of creation of an environment has influenced more and more publications in which the need for more intensive cooperation between the three sectors is expressed [Etzkowitz, Leydesdorff, 1995, pp. 14-19]. The cooperation of the three sectors in this article shall be understood as taking action towards a common goal, based on the identification with this objective, trust and acting in the interests of all participants [Czarniawski, 2002, p. 11]. Cooperation around the exchange and development of knowledge, leading to a strengthening of innovation contributes to the enhancement of local capacity and socio-economic development.

An additional element responsible for changing the prism of perception of this cooperation are constantly growing demands on the competitiveness of the players prospering on globalizing and integrating market [Castells, 2007, pp. 179-180]. As a result, concentration of business activities requires specific knowledge. This can be provided by greater urban centers, which are quasi-substitute for compact areas and whose specifics is similar to former polis [Mogens, 2011]. Located within their spatial and administrative borders, resources of knowledge – science (understood as entities connected with education, research, development, e.g. universities, and further: scientists, students), business (of all sizes and areas of activity) are being integrated and can be guided by local authorities. The degree of interaction of each sphere is different in each individual case, and depends on many factors, including inter alia:

- the size of the center and the degree of concentration of the actors,
- history, traditions e.g. in entrepreneurship,
- the level of development of different spheres/actors,
- their past and current activity.

Larger urban centers (e.g. with more than 100,000 residents; in Poland – voivodeship capitals), due to the currently observed trends (population movements in their direction) are steadily increasing the potential of knowledge [*Koncepcje regionalnej organizacji kraju*, 1991, p. 156]. As a result, the role of scientific institutions in big cities is growing, and human capital, directly contributing to increasing innovation, is becoming a key source of

competitive advantage [Pasterz, 2010, p. 80]. It should be noted, however, that long-term demographic trends are unfavorable for a large part of these centers due to the depopulation of almost all Polish regions [Szukalski, 2014, pp. 2-3].

Voivodeship capitals, where some spheres have developed more intensively due to historical events, formed a local model of cooperation in which one of the spheres is dominant. The academic sphere strongly influences the relationship between the actors in Warsaw, Krakow, Wroclaw and Poznan. As a consequence of the good will of former rulers, patrons of science and art, and then the treatment of these centers as places of particular cultural and scientific value (e.g. during the partitions, the interwar period and after World War II), the scientific sphere had the opportunity to secure its strong local position. The scientific sector in these cities developed a strong negotiating position and an opportunity to interact with the other actors. The potential of science in these centers can influence the policy of the local government, affect the business or even replace it in some areas (e.g. by supporting enterpreneurship among lecturers and students, conducting implementation research, forming clusters, commercializing the results of in their own companies' research).

Business plays a key role in some Polish cities, such as Katowice (and cities located around – Upper Silesia conurbation), Lodz, Plock, or in certain historical periods – Warsaw. The enterprise there supports and moderates the educational offer, e.g. by matching faculties to the current needs of the labor market, indicating the field for improvements in talks with municipalities and even developing and promoting innovation (creating research institutes, funding education, promoting their region, creating better conditions for workers and their families, integrating collaboration with other sectors).

Since the political changes in Poland (1989) and changes resulting from the Act of 1998 on a three-level administrative division of the state [Dz. U. 1998 nr 96 poz. 603] 18 major urban centers (voivodeship capitals) have had special conditions for the further operation. With representatives of the central level authorities positioned in these centres, modification of the existing system has allowed to strengthen their position. Their authorities gained access to larger funds and real opportunities to influence politics not only in their region, but also at the national level.

After 1989 companies faced a difficult task to compete in an environment where the market mechanism has become a regulator. This required the adoption of new, not yet used forms and strategies. Businesses and society relatively quickly adapted to the new rules of the market game. At the same time, local governments passed the slow process of transformation. Strengthening the role of the largest Polish cities after 1998 meant that they became strong enough to shape development (locally and regionally). Private sphere with a relatively rapid inflow of foreign capital, involvement of multinational corporations as well as higher and higher concentration in many markets needed strong partners – the authorities having a power of decision-making. Administrative reform of 1998 has provided these strong partners as local governments in voivodeship capitals.

Lack of urban policy and shortage of experience in the field of cooperation between the actors of the local community resulted in the city's attempts to assist entrepreneurs during their competition in the global market. The issues of innovation have been

neglected for a relatively long time at the local level – in the cities. National and regional policy have also taken up the issues relatively late. The established guidelines were more aspirations and visions than a specific plan and timetable for action to be taken. In 2000 Regional Innovation Strategies emerged as a result of the work of the regional authorities [Klepka, 2005].

The growing awareness of the importance of favorable geographical conditions caused that cities such as Poznan, Krakow and Wroclaw have fostered the creation of innovative institutions – technology parks. In subsequent years, the need for attention to the development of economic potential in the individual local government units has significantly increased.

Competition has extended from companies to local governments as well. Immediately after the Polish accession to the EU (May 2004) it turned out that one of the core strengths which enable the development of LGUs is the innovative potential of the city. Despite the undeniable advantages of large local governments, those smaller ones also began searching for the possibility of creating their own innovative areas based on local advantage.

Changes in the approach to cities could also be found in literature. Attention has increasingly focused on resources – information, knowledge, innovation. The new concepts of "creative city", "innovative city", and "city of learning" have spread. Topics covered in literature have influenced the formulation of urban policies, aimed at improving the potential of innovation and creativity in the entities operating in their region [Siłka, 2012, p. 11].

Cooperation between science, business and public sector is different in each urban center. The elements responsible for the blending of approaches have varied bases. However, in the local government authorities' awareness of the importance of this kind of integration measures, which should lead to the development of all three spheres and ultimately the whole local community, is increasing.

Consequently, it is worth analyzing such a cooperation at the local level. Bialystok is an example of the integration of the three sectors in which the leading role is played by the local authority (the etatistic model [Etzkowitz, Leydesdorff, pp. 110-112]).

3. Bialystok – the characteristics of the center

Białystok has currently approx. 300 thousand inhabitants [electronic document, access mode: http://stat.gov.pl/statystyka-regionalna/rankingi-statystyczne/miasta-najwieksze-pod-wzgledem-liczby-ludnosci/, date of access: 12.04.2015]. Since 1955 the population has increased eightfold. An especially rapid population growth occurred in the years 1980-1990 (over 20% population growth) [electronic document, access mode: http://bialystok.stat.gov.pl/, date of access: 23.03.2015]. Bialystok currently occupies an area of approx. 102 km², yet the impact of its potential is much greater.

As a result of the concentration of power, Bialystok has gained importance as the capital of one of the sixteen voivodeships (since 1999). Placing the government administration handling an area of over 20 thousand km² inhabited by approx.

1.2 million people in Bialystok has made the city the center of decision-making and development of Podlasie [electronic document, access mode: stat.gov.pl/cps/rde/xbcr/gus/L_powierzchnia_ludnosc_teryt_2012.pdf, date of access: 14.01.2015]. The core area determined by the administrative boundaries of Bialystok has become an attractive place for both residents and local government units within and outside of the region.

For the population living in neighboring municipalities, the city is the direction of daily commuting to work, education, culture and entertainment places. Bialystok serves as the administrative, economic, scientific and cultural center of the region. As a result of ever closer integration with the municipalities neighboring Bialystok, Bialystok Functional Area has been created (BOF). It consists of: the capital of Podlasie – city of Bialystok and 9 municipalities, including urban-rural municipalities: Choroszcz, Czarna Bialostocka, Lapy, Suprasl, Wasilkow, Zabludow and rural municipalities: Dobrzyniewo Duze, Juchnowiec Koscielny, Turosn Koscielna. All municipalities forming BOF belong to the district of Bialystok and are located in the central part of the region of Podlasie. It is therefore a natural zone of influence of entities from three spheres: science, business and public authorities. Bialystok Functional Area is bordered by the districts of: Sokolka, Monki, Wysokie Mazowieckie, Bielsk and Hajnowka. BOF surface is 1 728 km^2 and is inhabited by a total of 411 531 people [electronic document, access mode: http://bof.org.pl/onas.html, date of access: 22.03.2015]. The cooperation within the region and with neighboring local governments leads to synergy which also influences business and the sphere of science. The increasing concentration of population in this area encourages enterpreneurship and leads to increased demand for knowledge [*The Oxford Handbook of Innovation*, 2006, pp. 297-317].

Bialystok does not have such a long tradition and history as cities such as Krakow or Warsaw, making it difficult to identify previous historical advantages of each sector. In its early days it was only a point on trade routes. At the end of the seventeenth century Bialystok received city rights. Still, its role centered around the trade routes and residence of the Branicki family. It was not until the nineteenth century that a long-awaited change was brought – development of the industry (due to the annexation boundaries and restrictions regarding trade between the spheres of influence of the great powers) made Bialystok gain importance. Bialystok in the years 1807-1915 became a part of the Russian Empire and until the mid-twentieth century did not play a larger political and economic role in this part of Europe. It was the re-location of the city within the Polish People's Republic (PRL), then the placement of the provincial administration here in 1975 and further increase in its importance in the new administrative division in 1998 that led to a dramatic increase in the value of this city located in the eastern part of Poland.

Entrepreneurship in Bialystok was neglected during the partitions of Poland and the occupation (1807-1915), then destroyed during the Second World War (75% of the city destroyed) and limited and weakened in PRL (1952-1989). As a result, private business has only flourished in Bialystok for 25 years. Unfortunately, prior periods did not develop adequate tradition which forces Bialystok to work to enhance entrepreneurship [electronic document, access mode: http://www.regiopraca.pl/portal/rynek-pracy/wiadomosci/najbardziej-przedsiebiorczy-sa-w-warszawie-najmniej-w-bialymstoku-bydgoszczy-, date of access: 22.03.2015]. The private sector requires an

explicit support to be able to provide the further development of this area. Apart from a brief textile episode, Bialystok has no industrial tradition.

In 2014 in Bialystok the ratio of businesses registered in REGON to the population was only 11.12% (e.g. in Gdansk – 15.44%, Krakow – 16.67%, Olsztyn – 13.00% or Warsaw – 22.15%). This indicator highlights the weakness of business and low level of entrepreneurship among the inhabitants of Bialystok. Besides, now in Bialystok entrepreneurship is undergoing deconcentration (reducing number of large and medium-sized enterprises and growing number of the smallest). In Bialystok, in 2009-2014 we observed a 12% increase in the number of economic entities [electronic document, access mode: http://bip.stat.gov.pl, date of access: 11.03.2015].

Current sector of private enterprise in Bialystok has been activated as a result of the concentration of power in the local government. In this way, the administration of the twentieth century was an element that attracted both people and entrepreneurship to Bialystok.

Bialystok's tradition as an academic center is even shorter. Despite rapid development, it is not able to compete with Warsaw, Wroclaw or Krakow universities. In spite of the existence of three relatively large (for the eastern part of Poland) universities (Medical University of Bialystok, Bialystok University of Technology, University of Bialystok), the city cannot boast of equally long tradition in research or regionally and locally integrated staff.

One of the basic criteria for assessing the "academic character of the city" is the number of students in a given center (the more students, the larger impact they have on the local community). They influence, among others, the local rental housing market, they are the basis for the existence of a number of milk bars, restaurants, pubs, clubs and discos, they finance local cultural life. They also affect labor supply, which is of great importance for the development of enterprises.

Currently, Bialystok has approx. 45 thousand students and 19 universities [electronic document, access mode: http://www.bialystok.pl/824-ciekawostki/default.aspx, date of access: 25.03.2015]. Changing the positions of the universities in Bialystok (in the country and locally – in relation to business partners and government) requires time (e.g. University of Bialystok has formally existed since 1997) and the emergence of a tradition that will bond and determine the competitive position of these academic centers in Poland. Comparing the number of students to the number of inhabitants, Bialystok obtained ratio of 15%, which can be considered as average in the country. University towns such as Krakow, Wroclaw or Poznan (classic TH model) present the ratio of respectively 29%, 25%, and 24% [electronic document, access mode: http://wiadomosci.dlastudenta.pl/artykul/Najwieksze_miasta_studenckie_w_Polsce,105019.html, date of access: 21.03.2015]. Thus, their scientific potential is much higher, and it (if it remains in the center for a long time) determines the competitiveness of a given city.

In that manner, the public sector has gained an advantage over the other actors in Bialystok. Especially the twentieth century has restricted the development of the private sector, and the last twenty-fifth anniversary was primarily a period of expansion of the scientific sector – e.g. due to the ICT revolution (widespread Internet access). Despite favorable conditions for the other two players it is the government that has the highest

potential (financial, legal, moral, etc.), mainly due to the concentration of power. For this reason, local authorities have taken on the task of creating further development of Bialystok.

4. Innovation at local (regional) level – Bialystok

Despite numerous difficulties and much worse initial competitive position than the cities in western Poland, Bialystok has been intensively developing in the last twenty five years. Additional acceleration of the development has occurred in the last decade.

This was due to both endogenous factors (growing population, the accumulation of human capital from the whole voivodeship area and partly from the eastern border of the country, the development of universities, intensification of local entrepreneurship and the increasing internationalization of business, etc.) and exogenous (establishment of Bialystok as a capital of one of the sixteen voivodeships, increasing its political role, the growing importance of territorial cohesion which more and more resources from the national budget, the accession to the European Union which resulted in financing of many projects to accelerate the development, etc.). The use of the emerging opportunity lay in the hands of innovative entities (including ICT) operating in the agglomeration of Bialystok. This would not have been possible without the support of the public administration.

In Bialystok, processes of business deconcentration lead to business defragmentation. This process encourages to trace the innovation potential with particular emphasis on this aspect.

TABLE 1.

Summary of ICT entities and businesses by REGON in Bialystok

Year	Number of ICT entities (sections 26,61,62 by PKD 2007)	Number of businesses by REGON	Ratio of the number of entities of ICT to economic operators in total
2009	457	30059	1.52%
2010	512	31264	1.64%
2011	556	31339	1.77%
2012	596	32410	1.84%
2013	675	33085	2.04%
2014	761	33735	2.26%

Source: Own study on the basis of statistic data from BDL and GUS.

The above table (table 1) presents operators highlitghting the sections which are considered particularly innovative. The number of entities in the advanced sectors is steadily increasing. The growth dynamics in Bialystok in the analyzed period amounted to approx. 166%. The share of ICT in relation to the total number of enterprises in

Bialystok is almost 2.3% (not a high score compared to other voivodeship capitals). Thus, the development of the private sector towards innovation sectors has been relatively small.

Clusters are another form of concentration, which often connects entrepreneurs with science and local governments. The more numerous they are, the more intense the cooperation between sectors. Due to the area of activity and geographic location of cluster members, the measurement included the entire voivodeship. Thus, according to the Polish Agency for Enterprise Development in Podlaskie there are 9 clusters. In the case of Podlasie they associate a total of 527 entities, including 264 enterprises [electronic document, access mode: http://www.pi.gov.pl/PARP/data/klastry/, date of access: 01.04.2015]. Cluster initiatives in Podlaskie focuse very varied entities which positively affects innovation of undertaken projects. The local government actively supports efforts towards the creation and functioning of clusters.

TABLE 2.
Expenditure on R&D per capita and per employee in Podlaskie Voivodeship

Year	Expenditure on R&D per capita (PLN)	Expenditure on R&D per R&D employee (PLN)
2009	55.6	26 700
2010	86.2	42 600
2011	116.1	54 700
2012	115.8	55 500
2013	171.1	73 700

Source: Own study on the basis of statistic data from BDL and GUS.

The above table (Table 2) presents the ratio of expenditure on R&D per one citizen and one R&D employee. In assessing the innovation of economic activities in the area, it is worthwhile to pay attention to these indicators, because they are evidence of the local shape of the business sector.

The ratio of expenditure on R&D per employee is of particular importance. In the last five years, it has significantly improved in Podlaskie Voivodeship. The dynamics of expenditures in subsequent years in eastern Poland is much higher than in the western part of the country. Yet there is a still a relatively large difference between the expenditures (as an absolute value) on R&D in the eastern voivodeships and the western. The support given to private companies by the Bialystok local government is getting higher and higher every year, which enables them to increase the competitiveness and innovation [*own sources of the Municipal Office in Bialystok*].

The private sector is relatively weak and requires support from local authorities. This support is widened every year. In addition to the previously used tax exemptions and credits, support of initiatives to increase competitiveness, innovation and entrepreneurship concentration, construction of infrastructure and promotion of Podlasie enterprises, the local government decided to create a body that in the following years can contribute to the integration of the scientific community and entrepreneurs. It is the Bialystok Science and Technology Park (BPNT), which together with the Bialystok Sub-zone of the Suwalki

Special Economic Zone (Bialystok Sub-zone SSEZ) forms an area friendly to industry and innovation in Bialystok.

BPNT will not replace the activities of universities. The aim of the park is to supplement the offer of research units located throughout Podlasie and Bialystok, as well as to support actions to strengthen cooperation between science and business. BPNT is a product that combines elements of research and practice which ultimately contributes to the growth of innovative companies operating in the local market.

The potential of Bialystok universities is growing steadily, but still they are not able to compete alone with the leading scientific centers in the central or western part of Poland. The problem is the low level of concentration, as shown in the table below (Table 3). The three largest universities in Bialystok in 2013 educated a total of a little over 30 thousand students, while their counterparts in Warsaw – 89 thousand students, Lublin – 39.5 thousand students. In Olsztyn there is only one big university (27.5 thousand students). Hence Bialystok universities' cooperation is essential to start competing with larger centers. Support from the local government and entities such as science and technology parks, research institutes, and foundations may be crucial. Only in this way, as a united potential, Podlasie universities can strengthen their positions in the country and abroad. BPNT wants to support cooperation between universities and enlarge their innovative potential.

TABLE 3.

The number of students of selected universities in 2013

Name of university (3 categories) and number of students	City					
	Bialystok	Warsaw	Olsztyn	Lublin	Poznan	Wroclaw
Name of university	University of Bialystok	University of Warsaw	University of Warmia and Mazury in Olsztyn	Maria Curie-Skłodowska University in Lublin	Adam Mickiewicz University in Poznan	University of Wroclaw
Number of students	13411	46125	27470	21794	40633	26239
Name of university	Medical University of Bialystok	Medical University of Warsaw	–	Medical University of Lublin	Poznan University of Medical Sciences	Wroclaw Medical University
Number of students	4453	8743	–	7051	7089	5349
Name of university	Bialystok Technical University	Warsaw University of Technology	–	Lublin University of Technology	Poznan University of Technology	Wroclaw University of Technology
Number of students	12269	34135	–	10640	11320	34428

Source: Own study on the basis of: [Główny Urząd Statystyczny, *Szkoły wyższe*…].

In recent years, Bialystok universities have undergone numerous significant changes. Currently, their involvement in the creation of the economic sphere is getting larger. They carry out numerous programs whose goals are inter alia to: facilitate the transfer of human capital from universities to the Podlasie labor market, increase the degree of adaptation of graduates to meet the needs of Podlasie enterprises, improve the quality of education, promote research and development, etc. Bialystok universities are involved in plentiful projects and competitions, as a result of which they are becoming more recognizable in Poland and in the world, and in the future it could attract more human capital to Bialystok.

In addition, Bialystok universities are participating in the development of human capital at all levels of education, for example University of Bialystok leads "Children's University", and Bialystok Technical University patronizes several classes in secondary schools, which leads to an increase in the level of entrepreneurship and improve the quality of education. In Bialystok, there also operate Academic Incubators of Entrepreneurship, for example one is located at the Faculty of Economics and Management at the University of Bialystok. They support the establishment and development of business, which measurably affects the business independence of students.

Local Government, with its potential increased as a result of acquisition of EU funds as well as relatively high political force (11th largest city in terms of population in Poland [electronic document, access mode: http://stat.gov.pl/statystyka-regionalna/rankingi-statystyczne/miasta-najwieksze-pod-wzgledem-liczby-ludnosci/, date of access: 12.04.2015], one of the 18 voivodeship capitals) concentrated in Bialystok, could take steps to speed up the process leading to the growth of innovation in the region.

In addition to the indirect activities such as the promotion of business initiatives, concentration of Bialystok universities, organizing business events that allow for networking business (e.g. Eastern Economic Congress held in 2014 in Bialystok) [electronic document, access mode: http://www.wschodnikongres.eu/pl/, date of access: 12.04.2015], promoting business and universities in Poland and in the world, [electronic document, access mode: http://www.student.lex.pl/czytaj/-/article/bialostockie-uczelnie-podpisaly-porozumienie-z-miastem, date of access: 12.04.2015] etc., Bialystok authorities have taken on the role of both local TH integrator and motivator for further development activities. In order to achieve that goal, the EU project created Bialystok Science and Technology Park (two buildings with equipment: Technological Incubator and Technology Center of 13000 m^2 in total) and provided 23 ha of investment areas with utility infrastructure intended for entrepreneurs engaged in innovation activities [*own sources of the Municipal Office in Bialystok*]. Project to establish BPNT is in progress (2008-2015), with its estimated value of over 169 million PLN (including ERDF funding – 126 million PLN). It should be noted, however, that BPNT is already functioning and as a result of its operation only in 2014 companies received support in the form of the de mini mis of over 898 thousand PLN [*own sources of the Municipal Office in Bialystok*].

BPNT is a form of direct support for innovation, creation of innovative ideas and support for entrepreneurship. Thus, it complements the actions of universities located in this part of Poland and adds to innovative value of the area.

Technology Incubator (ITBPNT) is a place for people starting their own businesses (0-3 years on the market). ITBPNT's aim is to create conditions for development by: providing office space at preferential prices, access to contacts, access to modern infrastructure and marketing support, training and consulting, etc. An important aspect is the ability to use the experience of other companies operating within the ITBPNT or research institutions. Currently, there are 30 entities within ITBPNT that operate using modern technologies. BPNT locators represent mainly ICT, automation and robotics, electronics, e-marketing, mobile applications, e-commerce, telecommunications and computer graphics.

The second area of support is Technology Center (CTBPNT), which provides contact between science and business. It consists of: Molecular Imaging Laboratory (operator: SPV Medical University of Bialystok), Electromagnetic Compatibility Laboratory, Computer Graphics Laboratory, Biomedical Profile Laboratory, Physicochemical Laboratory [*BPNT own sources*].

By providing infrastructure located in the Technology Center, BPNT supports the commercialization of scientific research results and initiates the transfer of technology. The Center is a place where businesses with innovative activities based on modern solutions in their industries can operate. Currently, locators of Technology Center include ChM LLC – the largest Polish manufacturer of medical implants and instruments for orthopedics and traumatology and SAPLING LLC dedicated to developing technologies applicable in the field of wastewater treatment and sludge economy. These companies are a source of knowledge and potential partners for young entrepreneurs from Technology Incubator [*BPNT own sources*].

In addition to the above items, within the project entitled: "Innovation, collaboration and academic entrepreneurship accelerator BPNT" BPNT created two spaces: Transfering Space and Centroom. The first is housed in the Technology Incubator. It is a space where students and researchers can carry out projects for companies. It is a formula intended to encourage the commercialization of research and enable benefits for business by getting access to knowledge and new solutions, for students and university graduates by the opportunity to gain experience, develop their interests and use their knowledge, and for the scientific community by the opportunity to work on real business problems.

The second element of the project is Centroom. It is a coworking space located in the center of Bialystok (in contrast to other elements BPNT, which are placed near Bialystok Sub-zone – the industrial part of the city). The goal of Centroom is to support young entrepreneurs and people who want to start their own business by offering them favorable conditions for creative work. Centroom is a unique space, where for very little money you can rent a desk for hours, work on the project, take part in workshops, trainings and meetings to raise the competences of young entrepreneurs.

The second element of direct interference of local government units in the regional economy is the creation of Bialystok Sub-zone SSEZ in 2008. As a part of the project

entitled: "Preparation of investment areas for Bialystok subzone of Suwalki Special Economic Zone through construction of infrastructure and road surfaces" the necessary technical infrastructure (water supply, sewage system, rainwater, teletechnical) and surface of sub-zone streets has been built. The center is located in the same part of town as BPNT which makes this place a particularly friendly area for entrepreneurship and innovation. The total investment has exceeded PLN50 m, including funding from the ROP 2007-2013 – PLN44 m [*own sources of the Municipal Office in Bialystok*].

During the period 2009-2014, the 9 enterprises invested in Bialystok Sub-zone SSEZ (including the manufacturer of modern systems of heating and water, a manufacturer of electric water heaters, heat pumps, solar collectors, a manufacturer of plastic enclosures for electric tools and household appliances, industrial machinery manufacturers and printing industry). It is worth noting that as a result of the investment of local government units in the Bialystok Sub-zone SEZ, capital expenditures by entrepreneurs (at the end of 2014) totaled nearly 290 million PLN and created 819 new jobs. Ultimately, the declared value of the investment is expected to reach PLN 527 m which is ten times the expenditure incurred by the local government.

An important advantage of investing in SSEZ is the possibility of obtaining state aid for the costs incurred for investments or income tax relief e.g. for creating new jobs. The value of the public aid provided by the City of Bialystok to entrepreneurs in 2014 amounted to more than PLN 38.5 m.

Białystok Science and Technology Park and Bialystok Sub-zone of Suwalki Special Economic Zone are just two examples of local governments' direct impact on the functioning of the Triple Helix model in local conditions. In this way, Bialystok creates its present form, generating the potential for the next decades.

5. Conclusion

The character of the study was preliminary and informative. The holistic model research will be conducted as a part of a research grant, thus the spatial and methodological scope of the study was limited. As a result of focusing on one urban centre, the insufficiency of statistic data proved not problematic. During future extended research, the statistic and comparative measures of urban functional centres will be conducted, including research questionnaires for the three spheres.

In the analysis by the European Commission, it has already been recognized that "local and regional level activities are actually the best plane (...)", which enables contacting entrepreneurs and providing them with "…the necessary assistance in the field of external qualifications they need" [*Annual Innovation Policy*, 2009, p. 45]. It is the local level, due to the proximity of individual spheres and actors of the market game, that turns out to be the best place to boost innovation and create a knowledge economy.

In the case of Bialystok the local authorities have the greatest impact on the processes of innovation growth in urban functional area through support for business and science. The government has the tools to pursue long-term policies, which can contribute to increasing innovation of the city and thereby improving the economic situation

[Truskolaski, 2013, pp. 21-34]. For the last several years, support for cooperation between science and business has consisted mainly of indirect actions, and for about 5 years, local government authorities have been involved directly, creating conditions for the development of innovative activities. Local government has begun to create and through the right companies has become responsible for knowledge transfer and commercialization of research results.

As a result of the analysis, it can be concluded that the local government is currently a moderator of cooperation between the three sectors. It encourages other sectors to establish relationships and takes some actions that theoretically belong to the other two sectors. It should be emphasized that the role of the government is not limited to mediation between science and business, but also should concern innovative policy and share tools and instruments for supporting innovation [Palma, Peña Aguilar, Valencia Pérez, Lamadrid, 2011].

The weakest actor in the conditions of Bialystok turns out to be the private sector. Its significant fragmentation and still relatively low, though constantly improving, innovation means that it is not able to moderate co-operation between the actors at the local TH level sufficiently. The relatively low level of entrepreneurship among the population, lower competitiveness of the private sector in Bialystok compared to others (mainly western) voivodeships means that the private sector is not the engine of Bialystok's regional development. Ocurring profile changes (increase primarily in the number of sole proprietorships) make it difficult for this sector to influence the development of the region, develop human capital, participate in curriculum development or co-create a united front in negotiations with local governments. The interest of the private sector in developing business environment and commitment to the development of human capital in the last few years has been continuously growing.

Universities have a relatively strong position locally, they participate in the creation of innovative potential and development of the research environment, but domestically their impact is still relatively weak, mainly due to the much smaller size (potential) than universities located west of the Vistula. So it is recommended to further concentration of universities, as it can provide them with the potential and diversity of knowledge, skills and competencies necessary to compete with other research centers. Nevertheless, universities cannot be denied their resilience and dynamism when it comes to development (continuous improvement of teaching and research personnel, research facilities, grant programs and training). If the trend towards cooperation and concentration is maintained, in Bialystok there will be created a campus that will strongly influence not only the development of the metropolitan area but also of the entire voivodeship.

In every local innovative TH system, people are crucial [Etzkowitz, Dzisah, Ranga, Zhou, 2007, p. 15]. Knowledge and skills – potential accumulated in the society – decides on innovation and the further competitiveness of the area. Bialystok is in a particularly favorable position, because each year it educates nearly 45 thousand people, which is an equivalent to 1/8 of the population of this city. It is worth notingote that students form a group which successively supplies the labor market. Therefore, it should be carefully watched in order to pick out talents that may determine the competitiveness of the local community. Further development depends on this group and through the

cooperation of the three sectors conditions should be created that will encourage these people to live in Bialystok. Both the government and universities should pay attention to demographic trends and already prepare for a drop in supply of human capital. Developing a strategy for providing such changes may protect Bialystok against future problems.

The Triple Helix model is not only intended to promote the continuous learning and innovation, but also sharing knowledge and networking with individuals, organizations, institutions in order to achieve mutual benefit. This synergy of science, business and local government is to ultimately lead to the development that ensures the endurance of the communities.

In Bialystok the local authorities, understanding the meaning of the implementation of the relevant instruments to create innovation, have assumed the role of the leader. In addition to the indirect actions for the integration of science and business, directly affecting the shape of TH, e.g. creating BPNT or extending Bialystok Sub-zone SSEZ. In this way, in the TH statist formula, with the intervention of local authorities entrepreneurship, scientific sector and private sector are supported. Over time, this should lead to a higher level of concentration of these players, which will translate into increasing the importance of science and business and withdraw from direct intervention by the public sector.

Local TH model is aimed to serve the creation of innovation through cooperation of the three spheres (actors): science, business and local authorities (public administration). These activities are undertaken to implement the fundamental objectives of the audience – the public [Jasinski, 2004, pp. 7-8]. The main actor on the Bialystok stage of innovation is now the government that encourages the other actors (science and business) for greater boldness and activity.

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Izabela KIJEŃSKA-DĄBROWSKA, Marek MŁODOŻENIEC[1]

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BUSINESS-ORIENTED RESEARCH PROFESSIONALS – EMPIRICAL RESULTS FOR ACADEMICS' INTERDISCIPLINARITY AND THEIR COLLABORATION WITH ENTERPRISES[2]

Summary

The aim of the paper is to present profiles of scientists and research professionals who perform activities in favour of business. Characteristics of academics with reference to their scientific achievements, professional recognition and scientific interdisciplinarity are presented.

Profiles are created on the basis of analyses of empirical results collected from the survey taken among academic society. It is possible to compare profiles of researchers working for business sector to these who are eager to cooperate with companies. Characteristics concerning individual scientists refer to their age, gender, scientific degree and affiliation, together with the discipline in which they perform their scientific activities.

The following study is the part of the project aimed at investigation of Polish scientific community, with reference to interdisciplinarity in research fields and performance of Polish scientists. Analyses have been focused on studying relations between interdisciplinarity of research and successes of Polish scientists achieved at national level. The core idea of the given analyses is to identify and try to measure relations between business and scientific activities.

It is suggested that academics collaborating with enterprises are producing more voluble research and publications. These scientists are also appreciated as scientific professionals by academic society. Finally, researchers supporting enterprises with scientific knowledge and expertise present higher level of interdisciplnarity in their research.

Key words: entrepreneurial scientists, business-oriented researchers, interdiscpilnarity

1. Introduction

Science and innovation policies at global and national levels are aimed at supporting scientific activities for business purposes and strengthening entrepreneurial university activities. In particular, it concerns implementation of science-business support actions

[1] Izabela Kijeńska-Dąbrowska, Ph.D. – National Information Processing Institute, e-mail: izabela.kijenska@gmail.com. Marek Młodożeniec, M.Sc. – National Information Processing Institute, email: marek.mlodozeniec@opi.org.pl

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for engaging Triple Helix (TH) linkage between science and economy for innovation creation in favour of the research results commercialisation.

The notion of the "entrepreneurial university" has been present and evaluated in literature for the last twenty-five years [e.g. Clark 1998; Etzkowitz 2004; Lehrera et al., 2009]. In the case of Polish scientific environment it should be extended to the term "entrepreneurial research entity". It is caused by the fact that more than 95% of the research activities, both curiosity-driven and performed for the commercialisation purposes are conducted by public research entities. Specific combination of units acting within the R&D sector in Poland consists of three types of public research centres, in particular higher education units (HEUs), public research centres (PR&D) and institutes of Polish Academy of Science (PAS), [Kijeńska-Dąbrowska, 2011], together with a new type of private research companies.

Specific characteristics of the research environment in Poland enables to analyse jointly attitude of professionals conducting scientific research activities and working in each type of research entity. Thus terms: scientists, researchers and academics are used as synonyms in the paper. National policy toward science and innovation generally refers to scientists and research professionals, not depending on the type of research entity, unless it is defined as research or academic centre [Science Funding Act, 2010; Higher Education Act, 2005]. The notion applied in the paper can also be supported by the fact that entrepreneurial concept embraces universities and public R&D entities of all types, including these with a strong research tradition and those that are newly created by the market needs [Mohrman et al., 2008]. Finally, the literature on TH model of partnership cover three actors – government, industry and higher education [Etzkowitz, Leydesdorff, 2000; Etzkowitz, 2008; van Vught et al., 2010; Kim et al., 2012] and does not require obligatory structuring for different types of research entities that embrace similar activities as academic units.

It is of great importance for the economy and policy makers to learn the characteristics of researchers that are eager to conduct research in order to create new solutions to problems encountered by companies. It refers not only to technical, but also to non-technical problems that may occur during business performance. The contemporary scientific developments in various disciplines can be transferred into practical solutions adopted in companies. The technology, or specialist knowledge transfer, is no longer limited to technical and engineering disciplines. Thus analyses of researchers profiles in vast range of disciplines engaged in various types of entities and different scientific experience is required. The profiling procedures may result in stating suggestions for possible intervention for authorities or new strategies creation in the area of promoting knowledge based innovativeness.

For the purposes of the paper, entrepreneurial researchers are defined as those with positive attitude toward and experience in individual collaboration with companies. On the contrary, researchers with negative attitude toward and no experience in research for commercialisation purposes are set.

The pressure on commercialisation of academic know-how, together with the need of enhancing technology transfer process of knowledge created in academia, is of great importance for knowledge-based economies and for knowledge-based innovation

growth [Cook et al., 2008; Collier, Gray, 2010; Leydesdorff, Meyer, 2003; Hagen, 2008; Philpott et al., 2011].

There is visible change in the paradigm of research entities. Pure knowledge and research based involving individual curiosity based excellence is slowly replaced by societally shared knowledge based excellence [Gibb et al., 2012, p. 5]. With reference to individual academic activity within the process of innovation creation, it is expected for research professional to be prepared to engage in the transforming pure research results into commercial exploitation [Agraval, 2001].

Consequently, individual scientist should be eager to cooperate closely with the customer that is interested in application of research results. Profiling research professionals with reference to their will and ability to work on new commercial innovations in collaboration with business sector is at present of interest for social and economic scientists.

Studies on entrepreneurial behaviour of individual academics concentrate on subjects relating to different understanding of this attitude and various types of academic entrepreneurial performance [Bird, Allen, 1989; Duberley et al., 2007; Meyer, Evans, 2007; Mosey et al., 2012; Van Looy et al., 2011; D'Este, Perkmann, 2010]. Recent empirical studies on profiles of successful Polish entrepreneurial researchers focus on their scientific background and excellence [Knapińska, Tomczyńska, 2013]. In the paper presented here, the emphasis is placed on the vast range of criteria describing the entrepreneurial academics features and their attitude toward supporting business with knowledge based applications. Analyses presented embrace in a contemporary trend of empirical studies on profiling scientists with its exceptional and unique approach.

The notion of scientific interdisciplinarity is taken into the study as it refers to the idea of new knowledge and new technologies (innovations) creation. Many empirical studies prove that interdisciplinary research leads to innovative outcomes based on several scientific areas (multi-technology products), [Leydesdorff, 2007, Leydesdorff, Rafols 2011]. Additionally relations between actors taking part in the knowledge creation process, in particular academia, industry and public (consumers), shape the boundaries and definitions of existing scientific disciplines [Meyer, Rafols, 2010]. These boundaries are dynamic and constantly changing. New knowledge and innovations lead to emerging new markets, but at the same time they have the effect of emerging new scientific disciplines.

2. Research methodology and results

The idea of the study started from the question whether and to what extend collaboration between scientists and entrepreneurs is related to publication performance and peer-reviewing activities of research professionals. It has been expected that there is a positive correlation between collaboration activities and number of publications and number of peer-to-peer reviews.

Additionally, the second issue concentrates on whether the academics' collaboration with enterprises is related to professionals' scientific interdisciplinarity. It has been

expected that scientists with experience in business collaboration present higher level of scientific interdisciplinarity. While interdiscpinality might be defined as extending the scope of research interests and research over more than one scientific discipline, one can measure the level of interdisciplinarity using appropriate indicators.

Presented study is based on the on-line survey conducted in September-December 2013 by the National Information Processing Institute (NIPI) research centre among more than 54000 research professionals registered in the Polish Science Database. The primary analysis was aimed at the reviewing Polish scientific environment, whether or not it supports knowledge-based innovativeness (i.e. based on scientific achievements), thus the analysis was entitled Knowledge-Brokering Survey. Obtained database covered initially responses of N=14082 Polish research professionals. The response rate reached the level of 24.8%. Data gathered from the on-line survey has been supplemented with respondents' demographic characteristics from the „Ludzie Nauki" (Research Professionals) database: http://www.nauka-polska.pl/Ludzie-nauki.html. The database is administrated and processed by the NIPI. The demographic features of respondents taken into consideration concerned: gender, age, scientific degree and scientific discipline of origin, affiliation, together with number of publications and registered peer-to-peer reviews. Due to uncompleted information and missing values the initial number of observation from the Knowledge-Brokering Survey has been decreased to the level of N = 13727. All statistical analyses and calculations have been performed in R software environment.

The Propensity Score Matching (PSM) statistical technique on original data was used for secondary analysis in order to measure direct effect of academic collaboration with enterprises on their performance.

Secondly, analysis of the Stirling Index (SI) values set for scientific performance of individuals was conducted in order to measure correlation between academic's interdisciplinarty and individual's experience in business-oriented performance.

2.1 Propensity Score Matching Analysis

The first step of analysis of research professionals registered in the processed database concerned a simple comparison between average numbers of publications and reviews of respondents replying positively or not to the question concerning experience in business collaboration. Results of this comparison are presented in Table 1.

This comparison gives only preliminary findings. The two compared groups are highly differentiated. Number of observation in each group of scientists is not equal. According to the analysis, researchers collaborating with enterprises are on average older and have higher scientific degrees than scientists with no experience in working with business. At the same time, older researchers are those having greater numbers in both categories: papers and peer reviews. It is also visible, that academics collaborating with business are represented mostly by males. Majority of them work in public research centres and act in the field of technical and engineering disciplines. The differences in demographic characteristics of researchers are presented on Chart 1.

TABLE 1.

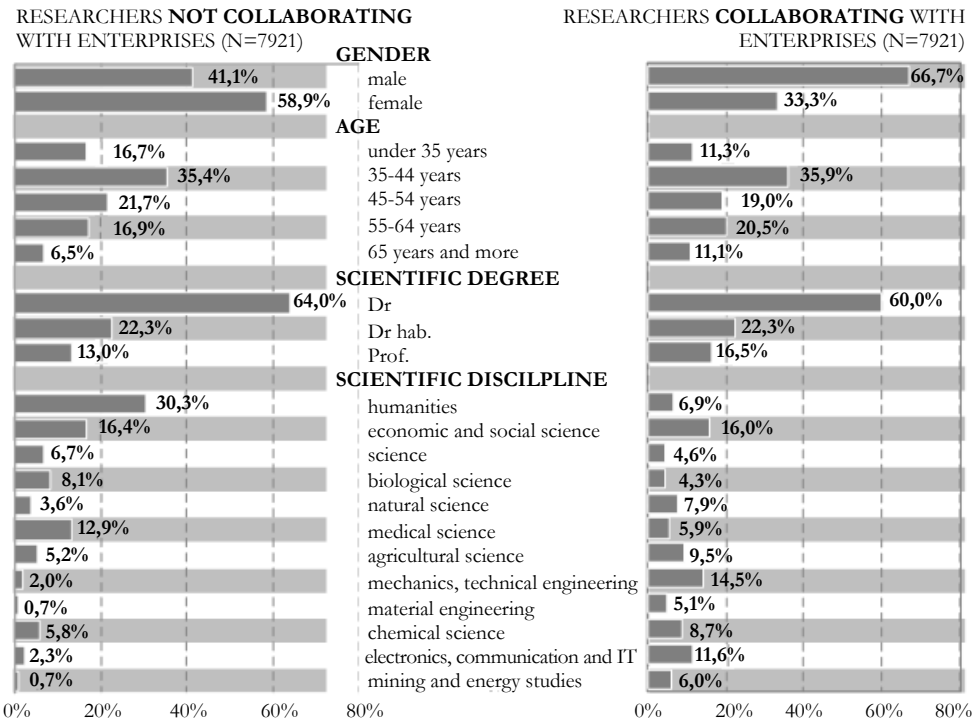
Average number of publications and reviews according to the experience in business collaboration

Question: Do you have experience in collaboration with enterprises on solving technical issues?	Average Publications No	Average Peer-to-Peer Reviews No
No (N=7921)	15.75	1.49
Yes (N=5806)	25.26	1.79
Average difference (collaboration "gross effect")	9.51	0.30

Source: author's own work.

CHART 1.

Structure and demographic characteristics of academics collaborating and non-collaborating with enterprises



Source: author's own work.

Differences in demographic characteristics are likely to affect average numbers of publications and peer-to-peer reviews of individuals. Therefore, direct comparison between groups, visible on Chart 1, is not proper. It does not confirm influence of academic's business collaboration on publishing or peer-to-peer reviewing of individuals. The scale of the influence is unknown due to structural differences in analysed groups of researchers.

Propensity Score Matching (PSM) is a sophisticated quasi-experimental statistical technique, which allow comparing mean scores within two groups, that differ in existence of a single experimental factor (experimental and control group). The difference in demographic structure of these groups, which may affect the simple mean scores comparison, is thus minimized.

Observed differences in average numbers of publications and peer-to-peer reviews in groups determined by value of independent factor (presence/absence of collaboration), given in Table 1, are described as collaboration "gross effect". The "net effect" of collaboration with enterprises on individual's achievements, the intrinsic influence of this collaboration on scientist' performance need to be refined in accordance with the given equitation:

gross effect = net effect (≈ casual effect) + effect of structural differences in compared groups of observations

The aim of the study was to measure direct influence of collaboration/no-collaboration with enterprises on individual's achievements understood as publications and peer-to peer reviews numbers. It was needed to compare achievements of individuals (described as dependent variables) being under the influence of existing independent factor (described as collaboration with business sector). The value of this independent factor can only have two variables. Scientists either have or have not experience in collaboration with enterprises. Thus, the collaboration activity was defined as a single experimental factor differentiating groups of researchers.

Propensity Score Matching (PSM) allows comparing mean scores within two groups, that differ in a presence of a single experimental factor (experimental and control group). The difference in demographic structure of these groups, which may affect the simple mean scores comparison, is thus minimized by drawing from control group a sample of "best matche" or "sibling" for all cases from experimental group (i.e. cases that match their demographic profile). Several statistical techniques are used to create the so-called "reference group", consisting of "siblings" and thus having structure similar to experimental group. The comparison of index mean scores between experimental and reference group is called "net effect". This represents intrinsic effect of an experimental binary factor on key index, as opposed to "gross effec" gained from comparison between experimental and control group, which may be highly affected by their demographic divergence.

PSM procedure requires calculating logistic regression, where experimental binary factor (i.e. having (or not) experience in collaboration with enterprises) is a dependent variable, and all variables that might interfere in inquired influence (mainly demographics)

acts as predictors. The presence of collaboration performance was set as value 1, while the lack of this activity was set to value 0. All accessible and registered in given databases information concerning individual scientists was used as independent variables (predictors) for the regression model. In particular following data concerning academics was taken into consideration:

- gender,
- age (in total number),
- scientific degree (4 categories: MSc; Dr; Dr hab.; Professor),
- single scientific discipline of origin (12 categories: humanities; economic and social sciences; science; biological sciences; natural sciences; medical sciences; agricultural sciences; mechanics, technical engineering and architecture; materials science; chemical sciences; electronics, communications and IT; mining and energy studies),
- type of research entity given as affiliation (public research centre, institute of PAS, higher education unit, private enterprise, medical unit and others),
- geographic origin of research entity at which scientists is affiliated (region/ voivodeship).

The final regression model used 37 independent variables[3]. Constructed model was statistically significant (Cox & Snell $R^2 = 0.233$; Nagelkerke $R^2 = 0.313$; $p < 0.001$), which states the significance of observed dependence. Most of chosen predictors were found as statistically significant. Exceptions concern: two scientific degrees (Dr hab, Prof), affiliation in Institute of PAS or medical unit and geographic origin of affiliation.

Applied in the study procedure of PSM used nearest neighbour method, as simplest and most common technique. There was no risk of inaccurate matching in the analysis, as the number of observations in reference group was considered high. Nearest neighbour method applies simple algorithm: each case from experimental group was matched with similar case drawn from that control group. Matched pairs have identical (or – if there is none – at least nearest) value of their Propensity Score as its own value ("best match"). Each of 5806 cases from the experimental group (collaborative academics) was matched with at least one of 7921 cases from control group (not-collaborative academics). Matching procedure was based on PS values (most similar cases). If there was more than one "best matches" available within control group, all these k cases were matched as one, with their weights set on 1/k. As a result, reference group is created, consisting of all cases drawn from control group as "best matches". The best matches cases constitute the reference group prepared for further analysis.

The quality of matching procedure was evaluated by the similarity of Propensity Score values for pairs of chosen cases. This condition was satisfied. Linked scientists (from reference and control groups) have the same gender, age, scientific degree and even do research in the same field. Potential differences might only concern external factors but due to adequate matching their effect in this analysis was minimalized. The mean distance on PS between two matched cases equals 0.0057% while the maximum difference at

[3] 36 instrumental binary variables and one continuous variable (age)

which cases were matched was 0.9257%. More than two thirds of matched pairs covered cases with exact values of Propensity Scores. These parameters provide an evidence for precisely fitting of matching procedure.

2.2. Stirling Index Analysis

Database of scientists created and processed for the purposes of the Propensity Score Matching procedures assessing impact of collaboration/not-collaboration with enterprises on academics' scientific performance (N=13727) was used as the reference for the analysis of Stirling Index values.

Interdisciplinarity in scientific performance of research professionals focused on the individual's ability to successfully do research in at least two separate research fields. This success might be evidenced by number of gained external grants for projects conducted in different scientific disciplines.

The applied concept assumed that successful scientists are those, who are prone to apply for external funding for their studies. Only leading, and considered as promising, research projects are accepted for such financing. The content of each research proposal is subject to evaluation of scientific significance, reasonable financial outlay, expectations concerning research results and value added to the state of knowledge. That concept thus guarantees, that academics working in research projects (accepted for external funding) from various disciplines are more likely to be interdisciplinary in their expertise.

With reference to the definition of interdisciplinarity used, the population of Polish research professionals applying successfully for external funding from the National Science Centre (NSC), Poland was considered as a source for potentially interdisciplinary researchers. According to the NSC schemes, funding grants are awarded in 25 separate scientific disciplines classified in three research fields (panels of disciplines): Arts, Humanities and Social Sciences, Physical Sciences and Engineering and Life Sciences. Complete list of the disciplines is presented in Appendix 1. Data sources used for the analysis cover research proposals accepted for financing in period 01.2011-05.2014.The processed database of NSC grants include information on N=4123 scientists who have been involved at least at two research projects either from single discipline or several research areas.

The next step of database preparation involved comparing number of individual cases that are both present in the database of potentially interdisciplinary researchers and the Knowledge-Brokering Survey. At this stage the number of N=2076 individual researchers complied with the criteria. Information describing these cases formed the database for measuring research interdisciplinarity of academics.

Indicators measuring research interdisciplinarity of individuals need to take form of a scientific disciplines distribution function. The highest level of interdisciplinarity should be reserved to scientists that do research in each of the enumerated scientific disciplines. In the case of the projects performed within the NSC schemes, project can be assigned to one of twenty-five scientific disciplines, thus the most interdisciplinary researchers would be these attaining twenty-five grants in twenty-five disciplines. The

distribution function of such constructed interdisciplinarity indicator takes the form of the vector of frequencies: $\{p_1, p_2, \ldots, p_{25}\}$, and the sum of frequencies is equal to one ($p_1 + p_2 + \ldots + p_{25} = 1$).

The Stirling Index was chosen to measure research interdisciplinarity amongst academics performing studies within the NSC grants. The SI is one of the common and simple measures used for determining similarities and/or disparities between scope areas of the research projects, papers or individuals' research fields. This indicator can also be used to analyse weather subject areas of two projects or two papers are similar or different. This indictor enables visualisation of the interdisciplinary/non-interdisciplinary research performance. It can be also used for comparison of interdisciplinarity levels between groups of researchers [Leydesdorff, Rafols, 2011].

The IS formula applied in the study has the form of equitation:

$$SI = \sum_{i=1}^{k} \sum_{j=1}^{k} d_{ij} \cdot p_i \cdot p_j$$

where d_{ij} states the distance measure between pair {i, j} of scientific disciplines. The value of d_{ij} represents the binary relation on set of 25 disciplines enumerated by the NSC. Thus the values range is $d_{ij} = 1$, in case of projects from separate disciplines, and $d_{ij} = 0$, in case of projects from the same discipline.

For the present study it was also needed to distinguish research interdisciplinarity within one research field (discipline panel) from research disciplinary over two research fields. Interdisciplinarity within single research field ought to be valued less than interdisciplinarity existing over two discipline panels. Finally, it was decided that distance measure between two disciplines would be doubled if disciplines derive from different discipline panels ($d_{ij} = 2$). In the set conditions the Stirling Index can attain values in the range $\langle 0;1⅓ \rangle$. The higher is the value of the indicator, the more distant are scientific disciplines and the higher interdisciplinarity of one's performance.

3. Results and interpretation

3.1 Propensity Score Matching Analysis

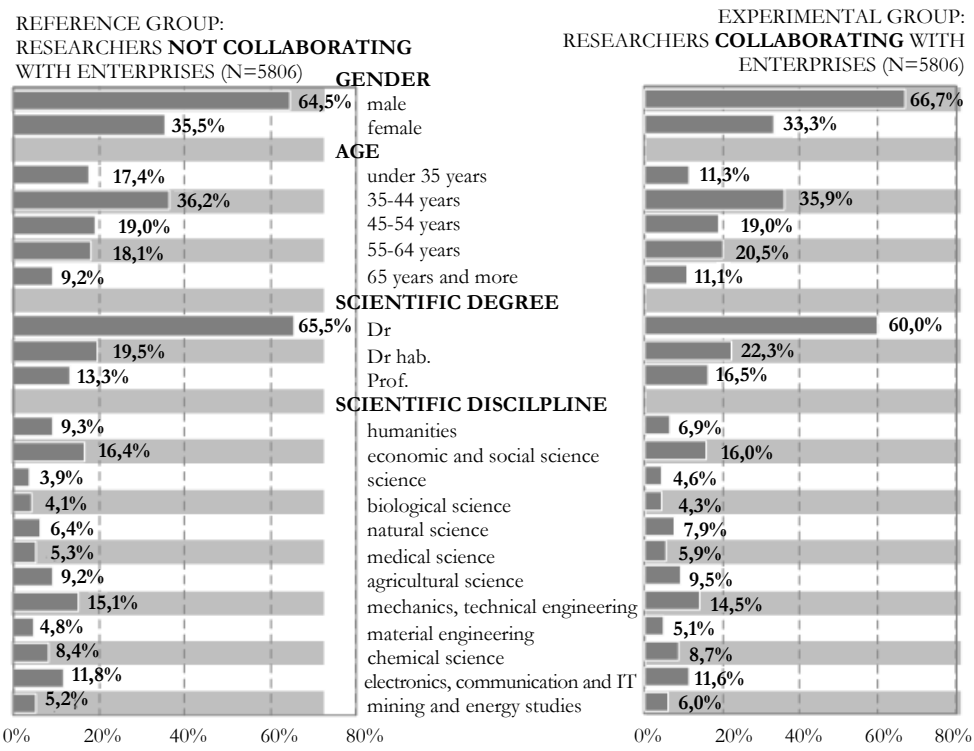
As a result of the applied PSM procedure, the reference group of academics not collaborating with enterprises was created. This group of scientists from reference group have similar demographic profile as scientists from experimental group (i.e. scientists collaborating with enterprises). As it is visible on Chart 2, the structure of reference group is much alike that of the experimental group. The minor differences presented are unavoidable residual of primary contrast between the groups and might be tolerated as not statistically significant. They do not have impact on different patterns of publishing or reviewing performance between experimental and reference groups.

The demographic disparity between groups of collaborating and not collaborating scientists was kept to its minimum. The only known factor contrasting both groups, and therefore the most likely cause of differing publication productivity and peer-to-

peer reviewing performance, is the presence or absence of experience in collaboration with enterprises.

CHART 2.

Structure and demographic characteristics of academics non-collaborating and collaborating with enterprises (reference and experimental groups) created as a result of PSM procedure

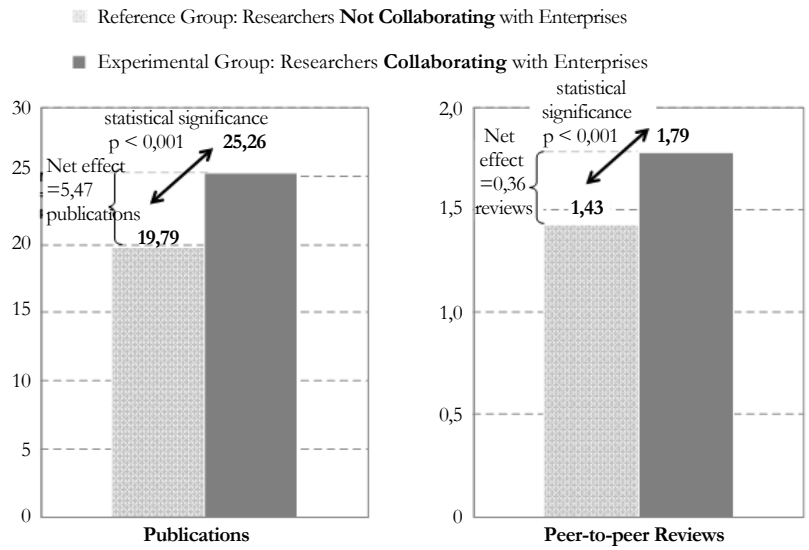


Source: author's own work.

Results obtained from the analyses of research performance indicate differences in publication and peer-reviewing performance between academics collaborating and non-collaborating with business sector. In particular researchers working with enterprises on finding solutions on technical issues are more productive in both publications and peer-reviewing activities.

PSM technique used for analyses enabled to exclude from observed positive impact of collaboration activity on academic performance, the intermediary effect of age, gender, scientific degree, scientific discipline and affiliation.

CHART 3.
Impact of business collaboration on publication productivity and peer-to peer reviewing performance (net effect)



Source: author's own work.

Indicated and presented on Chart 3 differences in averages numbers of publications and peer-reviews per individuals are statistically significant ($t = -10.171$; $df = 5805$; $p < 0.001$ for publications and $t = -4.068$; $df = 5805$; $p < 0.001$ for peer-reviewing performance).

Researchers taking active part in collaboration with business sector are prone to prepare more publications than scientists focusing only on scientific performance. Difference in average levels of publications per individual between experimental and reference group is significant. Scientists engaged in projects with enterprises encounter the average of 25.26 publications, while academics working solely on scientific issues publish about 19.79 research papers. Disparity in average numbers accounts for 5.47 publications, which covers 21.65% of publication productivity for business-oriented researchers. Scientists engaged in cooperation with enterprises are expected to publish 27.64% more than these with no experience in business.

Research results suggest that academics cooperating with entrepreneurs are expected to engage more in peer-reviewing activity in scientific community than academics not cooperating with companies. Difference between average numbers of peer-to-peer reviews between experimental and reference groups is not great in numbers. However, from the statistical point of view, it is significant. Business-oriented researchers are asked to prepare on average 1.79 evaluations of their peers' research work, while researchers

focusing solely on scientific activity prepare on average 1.43 reviews. Disparity does not refer to total numbers but is still significant.

3.2 Stirling Index Analysis

The values of the Stirling Index were calculated separately for each of research professionals recorded in the database of 2076 cases. Results of the average SI values for individuals with reference to groups of scientists collaborating and not-collaborating with enterprises is given in the Table 2.

TABLE 2.
Collaboration with enterprises and indisciplinarity performance of academics

Question: Do you have experience in collaboration with enterprises on solving technical issues?	**Stirling Index**
No (N=842)	0.092
Yes (N=1234)	0.071
Total (N=2076)	0.080
Significance level (p<0,05)	0.037

Source: author's own work.

It is visible that research interdisciplinarity level measured by the SI is significantly higher among academics having experience in working with enterprises over technical solutions than within the group of academics focusing solely on research performance. These results suggest that business-oriented scientists are prone to be more interdisciplinary.

4. Conclusions

Results of the study strongly suggest that academics with business orientation are likely to enhance their recognition within the scientific community. Scientists that join research performance and collaboration with enterprises are prone to prepare more scientific publications than academics focusing solely on research performance.

At the same time, competencies and knowledge of business-oriented research professionals are appreciated by academic society. Scientists with experience in collaboration with business sector tend to be asked more frequently to evaluate research work performed by other academic peers.

The observed tendency is contrary to common beliefs that valuable scientific studies might only be an outcome of purely scientific performance. With reference to conducted study, to become the prestigious scientist one needs to have experience in business cooperation and understands needs of entrepreneurs. It is suggested that significant

research is an outcome of interdisciplinary activity of individual academics joining purely scientific issues and cooperating with business sector.

Moreover, knowledge obtained from research performance should be at some point adaptable to solve technical issues of enterprises. Study gives the evidence that cooperation between academics and entrepreneurs over technical problems do not concern only research professionals from technical and engineering sciences. It is indicated that business-oriented researchers from each of enumerated scientific disciplines are prone to make greater number of publications and can be invited for peer-to-peer review more often than scientists not interested in academic-business cooperation.

As visible in the research, interdisciplinarity in scientific performance is correlated with the business orientation of research professionals. Academics cooperating with enterprises over solutions to technical problems are more interdisciplinary in their research than researchers focusing solely on pure scientific studies. Knowledge and competencies acquired by researchers from different scientific disciplines might be of advance for potential business collaboration. At the same time cooperation with enterprises might give research professionals an opportunity to start field studies in new, formerly undiscovered discipline.

Finally, it is important to underline that visible presence of Polish research professionals eager to work for commercialization of their knowledge resources suggests the change in the mentality of Polish scientific communities. Academic society seems to start understanding the knowledge paradigm development toward creation of more applied knowledge in business and industry sectors.

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APPENDIX 1.

National Science Centre Panels of Disciplines

		NSC Panel name	Disciplines
Arts, Humanities and Social Sciences	HS1	Fundamental questions of human existence and the nature of reality	philosophy, cognition, religious studies, theology
	HS2	Culture	literary theory and comparative literature, history of literature, linguistics, library science, cultural studies, arts, architecture
	HS3	The study of the human past	history, archaeology, ethnology, cultural anthropology
	HS4	Individuals, institutions, markets	economics, finance, management, demography, social and economic geography, urban studies
	HS5	Norms and governance	law, political studies, regional and social policies
	HS6	Human nature and human society	psychology, pedagogy/education studies, sociology
Physical Sciences and Engineering	ST1	Mathematics	all areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics
	ST2	Fundamental constituents of matter	particle, nuclear, plasma, atomic, molecular, gas and optical physics
	ST3	Condensed matter physics	structure, electronic properties, fluids, nanosciences
	ST4	Physical and analytical chemical sciences	analytical chemistry, theoretical methods in chemistry, physical chemistry/chemical physics
	ST5	Materials and synthesis	materials synthesis, structure-properties relations, functional and advanced materials, molecular architecture, organic chemistry
	ST6	Computer science and informatics	informatics and information systems, computer science, scientific computing, intelligent systems
	ST7	Systems and communication engineering	electronic, communication, optical and systems engineering
	ST8	Products and processes engineering	product design, process design and control, construction methods and engineering, material engineering, power units and systems
	ST9	Astronomy and space research	astrophysics/astrochemistry/astrobiology; solar system; stellar, galactic and extragalactic astronomy, planetary systems, cosmology, space science, instrumentation
	ST10	Earth system science	Earth science, atmosphere and climate, geochemistry, geodesy, geophysics, physical geography, geoinfomatics, planetary geology, pedology, mining, chemical and physical oceanology, changes and protection of natural environment
Life Sciences	NZ1	Molecular biology, structural biology, biotechnology	molecular biology, biochemistry, biophysics, structural biology, biochemistry of signal transduction
	NZ2	Genetics, genomics	genetics, molecular genetics, genomics, proteomics, metabolomics, bioinformatics, computational biology, systems biology and genetic epidemiology

	NZ3	Cellular and developmental biology	cell biology, developmental biology, ageing biology, neurobiology
	NZ4	Biology of tissues, organs and organisms	morphology and functions of animal's and human's systems, organs and organisms, experimental medicine, basics of neurology
	NZ5	Human and animal noninfectious diseases	mechanisms, diagnosis and treatment of diseases, poisonings and injuries
	NZ6	Human and animal immunology and infection	immunity, immune disorders, immunotherapy, infectious and invasive diseases, microbiology, transplantology, allergology
	NZ7	Diagnostic tools, therapies and public health	etiology, diagnosis and treatment of disease, public health, epidemiology, pharmacology, clinical medicine, regenerative medicine, medical ethics
	NZ8	Evolutionary and environmental biology	evolution, ecology, population biology, biodiversity, biogeography
	NZ9	Applied life sciences and biotechnology	agricultural, animal, fishery, forestry and food sciences; biotechnology, genetic engineering, synthetic and chemical biology, industrial biosciences, environmental biotechnology and remediation

Source: https://www.ncn.gov.pl/finansowanie-nauki/panele-ncn?language=en.

Igor YEGOROV[1]

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INNOVATION POLICY AND IMPLEMENTATION OF THE TRIPLE HELIX CONCEPT IN UKRAINE

Summary

Ukraine is suffering from low level of innovation activities and widening gap between the industry and research institutions, both in government and higher education sectors. This is reflected in shrinking of R&D financing, declining share of a number of graduates in natural sciences and engineering and some other indicators. Orientation on development of traditional industries of the national economies, such as metallurgy, basic chemicals and agricultural products prevents the country from focusing on knowledge production sectors. Lack of demand for R&D results widens the gap between the remaining R&D establishments and the industrial enterprises. Ukrainian state innovation policy has not changed substantially in recent years. Up to now, the main focus of government policy mix is on direct support of innovation in the form of (partial) financing of S&T programs and provision of direct financing to selected innovation projects. The gap between the higher education sector and the industry is substantial. Current legislation does not allow universities or research institutes to be founders of a spin-off company with non-state ownership in Ukraine. At the same time, it is evident that problems of innovation development could be solved only within broader context of transformation of the national economy. Implementation of the Triple Helix (TH) concept for transformation of the Ukrainian national R&D and innovation system could open new opportunities for its development.

Key words: innovation policy, R&D, technoparks, triple helix model, universities

1. Introduction

In recent decades, a number of concepts of national innovation systems were evolved to open the way for complex studies of the industrial and S&T systems in different countries. Triple Helix (TH) concept possesses an important place among them as it opens the way for comprehensive analysis of not only industrial sector and government sectors, but also for studies of interrelations between them and the universities. In reality, universities and other learning institutions play crucial role in the process of innovation development and growth of competitiveness of the national economies.

Introduction of new technologies and growth of competitiveness are interrelated processes, with technological advance is the central driving force behind economic

[1] Professor Igor YEGOROV – Department of Innovation Policy and High Technologies, Institute of Economy and Forecasting, National Academy of Sciences of Ukraine, e-mail: igor_yegorov1@ ukr.net.

growth [Nelson, Nelson, 2002]. However, it is difficult to determine these connections quantitatively in terms reasons and results [Dosi, Teece, eds., 1997]. At the firm level, final success depends not purely on 'technological' factors but also on organizational framework of the company, situation in the market, sector specificity and so on. In general, higher innovativeness is associated with higher competitiveness. So, in 1990--2000s, the share of innovative enterprises in Ukrainian economy was between 6% and 20%, while in neighbouring Poland it was at least two times higher [*Innovation in the Polish Economy*…, 2010]. These figures correlate with all major indexes of competitiveness for national economies, which are used for international comparison. However, the level of innovativeness could not be itself an indicator of commercial success.

In conditions of growing role of knowledge in modern economy, companies are modifying their businesses with the aim to increase 'intellectual' components in their assets and to strengthen their ties with universities. In general, intellectual assets are playing a growing role in production processes, especially in hi-tech sectors. This requires new technical skills and managerial capabilities for successful development. Modern firms have to have substantial in-house capacity to recognize, evaluate, negotiate, and finally adapt the technology potentially available from different sources.

In the EU, the innovations are among key priorities of the development [*Innovation Policy in Europe*, 2008]. Co-operation in S&T and innovation and R&D have strong support among European population. Innovation is considered as a key element of mordernisation of the European economy and a major factor of competitiveness of the EU industry [Hashi, Welfens, Wziatek-Kubiak, 2007].

On the other hand, post-Soviet countries, including Ukraine, are suffering from low level of innovation activities and widening gap between the industry and research institutions, both in government and higher education sectors. This is reflected in declining (or stagnant) share of R&D financing from the side of industry, shrinking civilian R&D in business sector, declining share of graduates in natural sciences and engineering and some other indicators.

It is evident that the Triple Helix (TH) concept is a useful instrument for analyzing current situation within Ukrainian innovation system thanks to its universalism and flexibility [Etzkowitz, Ranga, 2012]. However, it is worth to stress that the TH concept has found its interesting transformation in the publications of the Russian and Ukrainian authors in recent years. Analyzing the processes of creation and development of the national innovation systems in these countries some of them propose to consider incomplete TH models, which describe the situation in these countries more adequately. Thus, TH model transforms into several different 'double helix" models of co-operation between different sectors of national economies [Dezhina, Saltykov, 2006]. This approach reflects serious difficulties with innovation policy in the biggest post-Soviet states and certain fragmentation of the innovation systems. As a result, we will consider relations between the government and industry and the government and universities independently to some extent in this article. We will also pay attention to the state research sector, which constitutes an important part of the national innovation system of the country.

2. Development of the innovation system in Ukraine in recent years

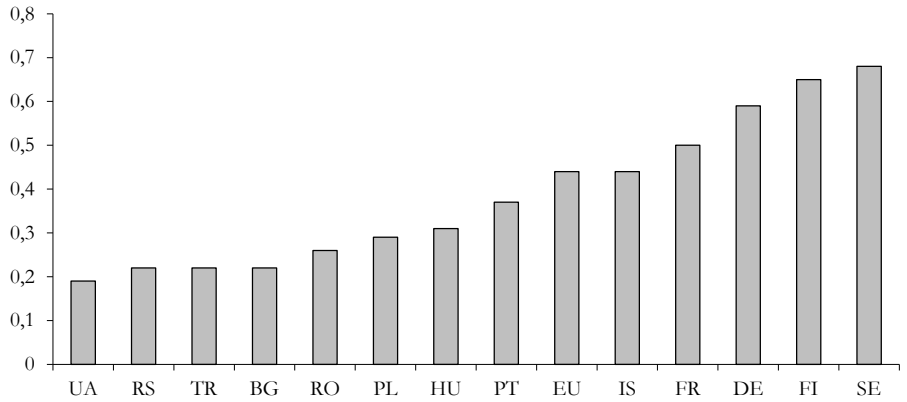
Almost all Ukrainian governments in the last decade have declared their intentions to support innovation development and to stimulate structural changes in the national economy to make it more innovative and competitive. However, lack of economic reforms and orientation on development of traditional industries of the national economies, such as metallurgy and fuel production prevents Ukraine from focusing on knowledge production sectors. Lack on demand on R&D results widens the gap between the remaining R&D establishments and industrial enterprises.

In 2000-2008 the country has demonstrated substantial economic growth with the average annual level of approximately 7%. Slowdown in the world economy in the second half of 2008 and in 2009 had serious impact on the Ukrainian economy, country's GDP declined by more than 14 %. A lot of Ukrainian enterprises had to stop their production. Some sectors have declined by more than a third during 2008-2009. Crisis created great problems in the financial sphere, especially for heavily indebted private companies, which reduced their R&D budgets substantially. In 2013, the country's GDP had not reached the pre-crisis level. In 2014, after political crisis, GDP plunged again to the new 'bottom' level, and in 2015 the decline by another 9% is expected. Innovation activity has dropped simultaneously.

The Ukrainian economy has clear export orientation but the bulk of the exported products are ferrous metals, basic chemicals and agricultural products with low level of value added. Technological modernisation was not a priority for Ukrainian business leaders. In recent years these sectors were indirectly subsidized through the system regulated prices for the input products (especially gas and energy), high artificial employment level and so on, while innovation companies had no special incentives to introduce new products and processes. Active collaboration with foreign companies can be an important ingredient of successful enterprise restructuring, particularly when competitive technologies are closely held, when export marketing links are crucial, or when outside methods and accountability are needed.

The decisions of the previous Ukrainian governments to preserve some high–tech industries under the state control (space and aviation are the most vivid examples) at the initial stages of reform are a clear example of such behaviour. In other sectors the government had intentions to provide selective support for a relatively small number of foreign companies. Very often the reasons for such support were not clear enough or some state officials preferred to arrange deals with one or two foreign partner on non-competitive basis. Internationalization of production in modern economy requires competitive strategies that are coherent in the face of powerfully supported international rivals, and generally requires reliable allies. This also requires creation of equal opportunities for different companies from the side of the state, as well as support of innovative companies are key precondition for successful restructuring and further development. The last evaluation of the Ukrainian innovation capacities on the base of indicators of the European Innovation Scoreboard was made in 2011 and it showed, that the country was lagging behind of the EU states and some its non-EU neighbours (see picture 1).

CHART 1.
The place of Ukraine according to the value of SII (in comparison with selected EU countries), 2008-2010



Legend: UA – Ukraine, RS- Russia, TR – Turkey, BG – Bulgaria, RO – Romania, PL – Poland, HU – Hungary, PT – Portugal, EU – average figure for the EU countries, IS – Spain, FR – France, DE – Germany, FI – Finland, SE – Sweden

Source: [*Enhance Innovation Policies*…, 2011].

It is important to stress that Ukraine had high marks for the level of education of population and some relative financial indicators, such as share of expenditures on IT in GDP, but the country demonstrated poor performance in patent statistics and innovation support policy. The problems of the R&D in Ukraine developed over many years and have now reached such proportions that neither quick nor inexpensive solutions are feasible. The challenge to government policy in the S&T area is how to mould the remaining national research capabilities into a pattern that will contribute more effectively to the processes of economic recovery. For the time being, however, R&D 'assets' are considered largely as a liability.

At the same time, in some cases, research institutes and design bureaus in Ukraine contain the results of R&D, which represent a potential of millions of dollars in commercial value. However, technologies for domestic development and technologies and products ready for competition in the world market are different things. Anyway, there is a potential opportunity for establishing more 'balanced' relations with Western partners in these cases. Some leading research institutes have already transformed themselves into research- production companies, with preservation of some R&D and creation a dozens of spin-offs that are doing business, including production of goods, on the base of former institutes. Such examples are not numerous among technology-oriented institutes in Ukraine. Very often these companies could not overcome relatively high entry barriers that exist in foreign markets, especially in developed countries. Costs, related to patenting, marketing and dissemination of their products appear unacceptable

in many cases. So, they are moving to the emerging markets of South-East Asian countries, Iran and some other states. However, such strategy could not be considered as a long-term one. Situation in the lowest segments of the market is usually strain and unstable. To be competitive companies have to try to enter the largest and the most sophisticated markets.

Decline of R&D financing in 1990s-2000s, when almost all research budgets were spent on wages and on bills for utilities has led to the situation, when the share of modern research equipment has shrunk by several times in many research institutes. About halve of all equipment could be written off balances of research institutes according to existing rules but this equipment has no adequate substitution [Yakubovskii, 2009]. Some institutes had to stop regular scientific experiments, needed for undertaking research programs. For example, the only experimental reactor in the Ukrainian Institute for Nuclear Physics was terminated in the first half of 1990s thanks to lack of funds to cover electricity bills. Since this time, Ukrainian nuclear physicists had very few opportunities to check their theoretical results. Similar situation was in the other natural sciences' institutes. This means that Ukrainian scientists had limited opportunities to obtain new competitive results. However, sometimes, it is possible to work in the Western countries due to special research schemes, which were introduced in 1990s-2000s within Framework programmes and other initiatives.

It is also important to stress that in the 1990s-2000s numerous mechanisms of business support were created with the state participation. In principle, they could be used to support innovation and research activities. Total number of business centres and business incubators is about 500. However, very few of them work effectively. The problem is that almost all types of business support organizations, with the exception of three technoparks were not oriented towards supporting innovation development (these three only out of 16 were related to innovation and R&D activities).

Up to now, the main focus of government policy mix is on direct support of innovation in the form of (partial) financing of S&T programs and provision of direct financing to selected innovation projects. Till the 2005, techoparks had some tax incentives for stimulating innovation activities but the abolishment of these incentives in early 2005 led to stagnation of technopark's development. In Ukraine, other mechanisms for supporting innovation enterprises are underdeveloped and they are often used in a pervasive way. So, in Ukraine in 1990s, almost all money from the specially created State Innovation Fund was spent on projects, which were not related to development of innovation businesses or technology transfer.

On the other hand, there are several 'ministerial' systems of organisations, which could be used to develop the system of innovation support. The Ministry of Education and Science has special centres of S&T information in almost every Ukrainian region (oblast). The biggest centre in Kiev has up to 100 employees. It collects information from local centres on all registered R&D projects and has to disseminate useful information on promising R&D results and innovation. The centres are more successful in undertaking the first task.

The most important barrier to innovation activities in Ukrainian enterprises is the lack of financial resources. Enterprises rarely use bank loans to finance innova-

tion activities as the interest rate is prohibitively high. It varied between 15 and 25% in 2006-2012, depending on the currency of the loan. Institutional barriers are also important, as well as a lack of demand in internal market. A number of venture capital funds were created in Ukraine under the special law in mid-2000s. However, their resources were exclusively used in the construction sector to finance boom in the property market. There is no information about support of innovation projects from the side of these funds. The State Agency of Ukraine on Investment and Innovation (SAUII) has prepared a draft of new law on venture funds to direct financial resources into innovation sphere in 2008. The new law has to install barriers for the utilization of 'innovation' money on other purposes. Unfortunately, this draft has not been considered by the Parliament in recent years.

Ukraine has initiated several innovation-related programs in the past. Most of them had disciplinary orientation on development of specific products, such as new computers or medicine. At the same time, some programs were formed as 'organizational' ones. So, in 2008-2009 the Ukrainian government developed and approved two state goal-oriented programmes. The first is a Programme of the development of the system of information and analytical support of state innovation policy implementation. The key objective of the Programme is monitoring of innovation development of the Ukrainian economy. It was designed for three years with a total budget of 10.5 m. Hr. The key idea of the Programme was to create effective instruments of monitoring of the state innovation policy at the level of central government and on the level of regions. Initially, there were plans to establish special groups at the state and regional levels, which could collect data, conduct surveys and prepare analytical materials on the situation in the innovation sphere. These groups had to work under the guidance of the Ministry of Economy of Ukraine. The second programme is the Programme of creation of innovation infrastructure in Ukraine. It was designed for five years with the budget of 280 m Hr. Ukr. It is assumed that the Programme will receive financing from different sources: from the state budget (104 m Hr.), local budgets (about 80 m Hr.), and other sources (private business and international donors – 96 m Hr.). The government hoped to attract investors to create technology transfer centres for small businesses within this Programme. Private companies could benefit from using the newly-created elements of infrastructures by provision of different services and products to innovation companies and by obtaining some privileges, including access to cheaper (subsidised) bank loans, information and expertise from the state research centres. Unfortunately, both programs had no proper financial resources in 2009-2012 and they were terminated in 2012-2013.

However, some programs were more successful. So, the Ukrainian Parliament has passed the new State Goal-oriented Space Program for 2013-2017. This Program is the fifth such program in Ukrainian history since 1992. The main aim of the program is to integrate activities of enterprises and research institutes in the space sector and to utilize R&D results more effectively up to the needs of sustainable development and national security. The program includes eight subprograms (similar to the previous ones), aimed at development new satellites for communication and the research of the Earth from

the space; further development of infrastructure; experimental projects on new space technologies; and joint commercial projects with other countries, first of all – the USA, EU countries, Brazil, Russia and some others. Ukraine has substantial S&T potential in certain important space technologies but during the economic crisis of the 1990s the country lost some of it. Now the country has to utilize more effectively the existing capabilities and has to develop new technologies and products to be involved in international efforts in space research and commercial exploitation of space technologies. In fact, it is very difficult to conduct space projects without co-operation with key international players in this area. That is why such co-operation is foreseen in the Program. However, in conditions of conflict in the East of the country and worsening of relations with Russia, perspectives of the implementation of the program look modest.

At the same time, it is important to stress, that problems of the R&D and innovation in Ukraine have developed over many years and they have now reached such proportions that neither quick nor inexpensive solutions are feasible. The challenge to government policy in the S&T area is how to mould the remaining national research capabilities into a pattern that will contribute more effectively to the processes of economic recovery. For the time being, however, R&D 'assets' are considered largely as a liability. It is evident that the growth of R&D expenses itself could not solve institutional problems that exist in Ukraine. Despite official support for 'national science,' the R&D sector is not a focal point of economic policy in Ukraine. Different laws are not properly coordinated as they are prepared by different interest groups. The most vivid examples are related to the permanent conflicts between the Ministries of Finances and the Ministries, which are responsible for S&T. For instance, in Ukraine, thanks to superiority of the Budget law over all other laws, the Ministry of Finance blocks all initiatives, aimed at support of R&D and innovation activities. The main reason for this blockade is the hypothetical possibility of the state income decline. Calculations of indirect benefits (in the form of new working places, growth of export and so on) are not taken into account.

3. Key features of the transformation of Ukrainian research system

Branch institutes had leading positions in the Ukrainian research system in the past. In some cases, the collapse of the old branch structure of the Soviet-type economy led to the development of new links between research institutes and industrial firms and, especially, to the development of direct links with foreign companies. At the same time, the changing boundaries between private and public sectors led to new, nationally specific systems of innovations.

One might expect that some applied research institutes and design bureaus were transformed into relatively small research or production companies and science-based SMEs. However, their future depends heavily on the speed of economic transformation in key manufacturing industries. If Ukrainian manufacturing enterprises develop better access to international markets and strong ties with foreign partners, this will have

an obvious and positive effect on industry-oriented R&D institutions. Without clear signals from the industry in the form of new orders and, in some cases, without sufficient financial support, research institutes will be unable to retain their best staff or to update their technical base.

In contrast with the branch institutes and design bureaus, research institutes of the Academy of Sciences in Ukraine rely on the state budget as the main source of their financing. They receive approximately three quarters of their funds directly from the state. This level of financing does not guarantee effective development but provides basis for survival of research institutes. In recent years, the number of employees in the Academies has stabilized, while the number of research institutes doubled. The share of the Academies of Sciences in the total financing R&D and the share in the total number of employees in research sector have increased in recent years [Yegorov, 2009].

There are more than 300 universities in Ukraine. More than two thirds of the country's doctorate holders are working there. However, contribution of universities into R&D activities remains relatively small. Universities received 5-7% of all R&D funds in recent decade. The higher education sector and the private non-profit sector have not plaid a significant role in the R&D financing both retrospectively and in the current period. The higher education sector as an executing agent of R&D is still extremely dependent from the state financing (the range of the state funds was 68.7%-74.7% of the total financing of the universities in the last two decades).

The gap between the higher education sector and the industry is substantial. Current legislation does not allow universities or research institutes to be founders of a spin-off company with non-state ownership in Ukraine. At the same time, it is evident that problems of innovation development could be solved only within broader context of transformation of the national economy. Another factor, that has negative impact on innovation, is the armed conflict in the East of the country: Ukrainian authorities simply are not focusing on non-military issues.

Universities are trying to change the situation. On December 20th, 2006 special Law on scientific parks passed through Parliament. The key feature of this law is that it does not contain norms, aimed at obtaining specific financial incentives for parks. There were plans to create a number of such parks within the country's technical universities. However, economic crisis of 2008-2009 has ruined these plans. Very few scientific parks have been created in Ukraine since this time. The most well-known of them is the Kiev Polytechnic Institute (University) Science Park in Kiev. The University tries to implement the idea of Triple Helix at different stages of its functioning. Initially, the park was created as a part of the EU-sponsored Tacis-Tempus project (2004-2006), aimed at bridging the gap between the universities and business. The University and its partners have created 5 special foundations to provide financial resources for the innovation projects. Students spend up to 30% of their learning time on innovation studies. Special 'start-up' school has been created too. In 2014, rector of the University expressed an opinion, that only 10% of students could be entrepreneurs but the knowledge of innovation processes is useful for all graduates. More than 110 start-ups have been created in this science park, and more than 150 different products have been commercialized. Total financing from business reached 23.4 million Hr. in 2014.

University has plans to build special Science City with approximately 5500 employees and 170 million USD of investment [Bazhal, 2015]. Another model is used by the Science Park in Kiev Shevchenko University. This park has five different stakeholders, including another university and 3 research institutes of the National Academy of Sciences. However, this park was not so successful, as previous one.

Ukrainian universities should be given a certain degree of financial autonomy. This will allow them to perform quickly certain financial transactions and to avoid long bureaucratic procedures, which are used by the Treasury of Ukraine. An additional incentive for commercialization could be a granting the universities rights to distribute funds, derived from contract research, as well as to utilize revenues from the licensing of intellectual property. According to international practice, such steps are usually aimed at creating and improving university technology transfer centers, to support research and development international projects, upgrade technological support, etc.

A greater degree of autonomy of universities will allow them to use such source of commercialization of intellectual property as venture capital. Another source of funding is specialized investment funds, whose activities are concentrated in potentially profitable innovation projects. This practice is common in developed countries and it allows to receive substantial effect from scientific and technological development. On the practical side, the adoption of draft laws 'On venture funds of innovation development' and 'On venture investment companies' could give impetus to the revival of innovation sphere and to commercialization of scientific results in Ukraine, both for companies and for higher education sector.

In response to the challenges of modern times, the world's leading universities have felt the need of transformation – they turned to the powerful academic centers that produce new scientific development and training products in the future enter the market. These entrepreneurial universities represent an economic corporation that produces knowledge, and individual faculties have the opportunity to test their competitiveness in the market and receive from this income, which is aimed at the development of the university. Central to their work is technology transfer and commercialization of research results. As these universities interested in obtaining the maximum added value from the commercialization of its own technology, they contribute to the growth of the projects from an idea to a successful business or technological implementation [*Excellence v Equity*…, 2015]. Ukrainian universities have to follow this practice.

While the principles and practice of financial support of R&D is of considerable concern, the aging of the research community, outflow of research personnel from R&D institutes and the obsolescence of their research equipment pose another threats to the future of R&D systems in Ukraine. The bulk of researchers in Ukraine are of mature age (average age of Doctor of Sciences is over 61), and the opportunities for recruiting young scientists are very limited. Gifted young persons could chose between a research career in developed countries and work in business that brings much higher income than work in the national research establishments. The same applies to the aging of research equipment. It is clear that without remedial actions, the productivity of

the system will continue to fall, with negative consequences for the economy as a whole.

Ukraine urgently needs not only a serious transformation within the S&T system, but also important changes in their environment. So, the introduction of adequate legal protection for intellectual property rights, especially in foreign countries, is of critical importance for individual researchers, S&T institutes and science-based SMEs. This is also very important for foreign companies seeking to engage in direct investment or some other form of business alliance, and for domestic companies that co-operate with them.

4. Cooperation with the EU countries and its impact on the transformation of research system in Ukraine

In 2002, Ukraine signed an agreement with the EU on S&T co-operation, including basic and applied research and technology development. Key thematic areas of co-operation were also determined. They comprise environmental and climate research, including observation of the Earth's surface; biomedical research and health protection; agriculture, forestry and fishery; industrial technologies; material science and metrology; non-nuclear power engineering; transport; information society technologies; social research; S&T policy studies; training and the exchange of specialists. This agreement supplemented earlier documents that were signed in the 1990s (The Agreement on Partnership and Collaboration between Ukraine and the EU and some others), opening the way for co-operation between Ukraine and the EU in different areas of science and education (programmes such as Tacis-Ace, Tacis-Tempus and INTAS).

In 2005, Ukraine and the EU signed an Action Plan, containing important references to the need to develop co-operation in R&D. The Action Plan was an important component of the European Neighborhood Policy Initiative (ENPI). Recently the Ukrainian Parliament has approved an official Ukrainian application to Eureka. Ukraine has a number of bilateral agreements on S&T co-operation with individual EU countries, which complement the main agreement with the EU. In recent years, all Ukrainian governments have announced their intention to develop closer relations with the EU, and European Union policy has a strong influence on formulation of science policy in Ukraine.

Ukraine concluded a new agreement with the EU on S&T co-operation in 2010, which was implemented in 2011. It could open new opportunities for co-operation and it creates framework conditions for a number of joint initiatives. Bearing in mind the intention of the country to join the EU in the future, the Ukrainian authorities are interested in harmonisation of national research policy with EU policy. The Research Framework Programmes, which bring together research organisations from EU member-states, is one form of co-operation that has become available for Ukraine since the early 1990s, during the Third Framework Programme (FP3), when an agreement for partnership and collaboration was signed between Ukraine and the EU. The country signed an agreement on association with the EU Horizon-2020 program

in March, 2015. This opens the way for more active co-operation with the EU countries in R&D in the near future. The impact of the participation in the EU FPs is definitely positive, as Ukrainian scientists receive valuable new experience and knowledge, and strengthen their contacts with western partners. On the other hand, this impact is limited as the number of participants is not high. Co-operation between Ukrainian and EU researchers remains relatively low. Additional support from the Ukrainian government for the promotion of FP activities is needed as well as additional links between Ukrainian researchers and their EU counterparts to forge partnerships in future projects. Support for capacity- building measures in research and innovation through ENPI could help in this regard. As a non-EU member, Ukraine cannot participate (at least, as a leading partner) in some FP-related initiatives. Another problem is that existing internal taxation practices do not support international project implementation, despite there being some clauses in EU-Ukraine agreements on special financial conditions for R&D projects. This creates serious barriers for co-operation.

There is no direct influence of the EU Programme on priority-setting in Ukraine, although the Ukrainian policy-makers study the content of the FPs attentively and the results of these studies are used to formulate research agendas in different ministries, universities and state academies of sciences [Zinchenko, 2013]. As to the results of the previous co-operation programs, they are analyzed in one of our paper, published recently [Yegorov, Ranga, 2014].

6. Conclusion

In general, R&D and innovation sectors in Ukraine remain unreformed and underutilized. It is evident now that lessening state control over the process of transition is not having the desired effect in many cases, especially in transforming the R&D system. Weakness and uncertainty of S&T policy has conspired with the economic crisis to inflict losses in terms of manpower and technical assets in Ukraine, and indeed to produce unfavourable structural changes. The crisis in Ukraine could be solved only by co-ordinated efforts on the part of the state and scientific communities. The challenge to government policy in the S&T area is how to mould the remaining national research capabilities into a form that will contribute better to the process of economic recovery and further development. For the time being, however, R&D 'assets' are viewed largely as a liability. This is partly the result of structural and organisational mismatches, and partly because of their low immediate relevance to market realities. Creation of favourable conditions for science-based SMEs could help to solve the problem of adequate utilization of intellectual capacities of former scientists and engineers and it also could contribute to the positive structural changes in the national economies, which have high shares of traditional heavy industries.

The transformation of national innovation system with special attention to co-operation between enterprises, state research institutes and universities is critically important for the country. Ukraine needs much more institutions that would have potential to finance innovation sector. These institutions have to accept high level of

risks for high potential profits and the same time, they will not require collateral, nor charge interest payments. It would be also important to provide not only short-term, but also long-term and at least medium term loans and to contribute to boost innovation activities. As to the business environment, it is very useful to create conditions, where entrepreneurs will be willing to sell significant part of their shares to outsiders and also they will be willing either to be acquired or to participate in public offerings. Labour market has to be sufficiently flexible, as top quality managers and technologists will be available to staff of growing firms.

It is evident that, at the current stage of development, it would be extremely difficult to obtain financing for innovative enterprises from private sources in Ukraine. That is why the state has to play more active role in stimulating creation and development of such cooperation within the national innovation system in Ukraine. In some cases, even such mechanisms as long-gestation projects, involving basic research with the state support could be justified. There is a plethora of different types of incentives, which government could use, including financial and fiscal incentives, direct lending programmes and so on. The problem lies in choosing right combination of these incentives, as government involvement easily creates market distortions, cause problems of moral hazard and adverse selection.

The government has to accept that innovative enterprises and research institutes need special treatment and it has to develop mechanisms, aimed on their support. This will have positive impact on industrial structure and the general economic indicators, as such enterprises usually have better cost structure and higher value-added than non-innovative enterprises. Programs on supporting dissemination of innovations in industrial companies have also to be initiated. Absolute majority of these companies have no enough knowledge about the best practices in their industries, nor enough resources to introduce innovations. Utilization of modern technologies and switching to new products could lead to substantial growth of productivity and positive changes in other economic indicators.

Bearing in mind rapid changes in technology and markets and the increasing focus on exports, banks, private venture funds and state organizations have to develop specific expertise in project evaluation. Existing technologies and know-how could be commercialized, and bring substantial dividends to the countries in transition. At the same time, technology transfer from the West could help to solve not purely economic, but in some cases, severe environmental and social problems, from which Ukraine is suffering, too.

Special attention has to be paid to the development of cooperation with the EU states. This cooperation brings important expertise in the most advanced areas, and it will help to compensate above-mentioned shortcomings of the national innovation system of Ukraine. In terms of TH model, this cooperation will be important for transformation of existing 'partial' ('dual') 'sub-models into functioning three-part model, which is common for developed countries. Some preconditions for widening of such cooperation are in place, as Ukrainian researchers are trying to take part more actively in the EU scientific initiatives. It is important now to attract Ukrainian companies to joint innovation projects. At the same time, the level of coordination of innovation and science policies with the EU programmes has to higher. In this case the chances of

success could rise, as the some Ukrainian neighbours from Eastern and Central Europe have demonstrated.

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Anna GARDOCKA-JAŁOWIEC[1]

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CONSUMPTION AS AN ACTIVE ELEMENT OF THE ECONOMIC PROCESS IN CONTEMPORARY ECONOMY

Summary

The goal of the article is to analyse consumption as an active element of the economic process. The considerations aim to show that consumption not so much concludes but rather initiates the economic cycle. Consumption determines the situation of individuals by influencing their work performance, its rate and intellectual efficiency. The satisfaction of needs, collection and allocation of consumption resources leads to specific effects (in this indirect effect of consumption). The considerations highlight that the development of productive forces is not a step process. Rather, it should be smooth and spread over time.

Key words: consumption, needs, consumption resources, effects of consumption

1. Introduction

In the last decade of the previous century and the first of the 21st century – in the time of spectacular technological developments, the changes of social, economic and political environment led to the change in perception of the importance of consumption. The purpose of the article is to analyse consumption as an active element of the economic process – consumption not so much concludes but rather initiates the economic cycle. During consumption, there occurs transformation of some resources and streams of goods and values. The individual is not only a user of goods and services, but also their creator – a direct factor of production, a creator of economic process. Man establishes the rate of socio-economic changes. The effectiveness of this process depends on man. From the participants of the economic process is requested:

- flexibility (propensity to change, cooperation) in adapting to the continuous and turbulent changes in the environment and the ability to function in chaotic and crisis situations;
- economic activity, based on sustainable assumptions (i.e. a holistic and ever-developing view on reality) and growing resources of knowledge (tacit and explicit);

[1] Dr Anna Gardocka-Jałowiec – Faculty of Economics and Management, University of Bialystok, e-mail: anna.gardocka.jalowiec@gmail.com.

– control and adjustment to the changing institutional factors both formal and informal (this means including in one's economic activity such things as trust, ethics, values, afterthought).

Consumption determines the situation of individuals by influencing their work performance, its rate and intellectual efficiency. The satisfaction of needs, collection and allocation of consumption resources leads to specific effects. The effects are important for the development of human and social capital.

The considerations are theoretical. They collect observations and subjective opinions resulting from analysing other works in the subject. The author knows that these issues require deeper analysis. Meanwhile, in the presented work, she presents her synthesis in accordance with editorial requirements.

2. The system of consumption

Numerous social disciplines express an interest in consumption (e.g. sociology, psychology). Everyone intuitively feels the essence of consumption – we encounter it every day, from the day we were born. It seems to be easy to define, yet this is a false impression. Because of its multidimensional and multi-attribute nature, an intuitive attempt at finding the meaning of consumption gives only a superficial and usually narrow and imprecise definition: consumption means the satisfaction of human needs. The analysis of consumption involves four important segments: human needs, objects of consumption (the means for needs for satisfaction), consumption behaviour (the ways of needs satisfaction), and the effects (results) of needs for satisfaction.

Literature shows that consumption is a direct act of satisfying human needs by a full or partial usage of a given good or service. However, repetitiveness of the acts of consumption makes for a social process comprising of behaviours and actions of individuals which base on realizing one's own needs, prioritizing them, choosing the means of satisfaction, as well as the act of needs for satisfaction along with their following results. Consumption includes also the conditions, phenomena, and processes taking place in a nation's economy, having a direct or indirect relation to satisfying human needs. This last meaning sees consumption as a phase in the process of social reproduction, also called the consumption phase, or sphere of consumption [Bywalec, 2010, pp. 12-13; Małysa-Kaleta, 2010, pp. 15-16; Bywalec, Rudnicki, 2002, pp. 13-15]. Therefore, consumption is: an act, a social process, a sphere of consumption.

The whole of consumption processes create the system of consumption. It is believed that the system of consumption involves: subjective system, objective system, and a system of shaping consumption [Kramer, 1997]. A different approach says that apart from the subjective and objective systems, there are also the system of organizing consumption, and the spatial system of consumption [Kiełczewski, 2008, p. 54]. All authors agree that the unquestionable systems include the subjective and objective systems. The differences lie in soft conditionings of the system of consumption.

From the above-mentioned concepts of consumption systems, the latter seems better as it describes the nature of the process of consumption in greater detail. It is, however,

useful to change the organizational system with the institutional system, this being a far broader category. The institutional system shares popularity with the developing trend of institutional economics, i.e. on departing from T. Veblen's institutionalism. Contemporary institutionalism (the so-called new institutional economics) distinguishes institutions and organizations as separate, and more importantly, it does not limit itself to describing them, but it also studies them. It involves not only the organizations responsible for implementing and coordinating formal and informal institutions but also the institutions themselves. Finally, it can be summed up that the system of consumption is comprised of: the subject system, the object system, the institutional system, and the spatial system.

The subject system of consumption includes the processes of consumption according to its subjects, i.e. the consumers. This gives high significance to: demographic structures (age variation, average life expectancy, birth rate, the scale and direction of migration), socio-professional structure (e.g. level of education, profession, relations with the internal and external business environment), as well as the budget and sources of consumer finance. These factors have decisive influence on the living standards, preferences, and behaviours of individuals. They shape the direction of consumption – its present scope and future development. The level of stability of consumer income influences his/her stability of life, thus increasing the chance of an intergenerational balancing of consumption processes.

The object system of consumption describes the character of human needs connected with the civilization level of the production processes for goods and services [Kielczewski, 2008, p. 58; Kramer, 1997]. The objects of consumption may include: material goods which are physically used-up in the act of consuming (e.g. food, clothes), material goods of symbolic significance (works of art, religious items), immaterial social and cultural valuables (knowledge, information, safety, social acceptance), performed services (medical treatment, education, transport), [Bywalec, 2010, p. 15]. The shape of the subject consumption system and the level of economic development determine different structures of object consumption. According to the three-sector theory, in the higher stages of economic and social development the share of food sector decreases, the industrial sector starts to decrease after a certain point, and the service sector's share increases. This situation is well illustrated in the sphere of consumption.

The institutional system involves: formal and informal institutions, and the organizations responsible for their introduction, coordination and execution. Informal institutions are the extralegal norms of behaviour, such as customs, traditions, beliefs, religious norms. They are sometimes referred to as "deeply rooted" or "socially rooted". Formal institutions are the legal (regulated) norms of behaviour which function inside an institutional environment, i.e. in the sphere of tradition, culture, religious beliefs, all that builds a historical legacy of a nation. Formal institutions are characterised by higher changeability and shorter introduction time than informal institutions. Informal institutions are far greater in number than formal ones, and play a vital role in the life of a society. Yet, between both forms of institutions there is a correlation, transitivity. Both are developing, both control and regulate human activities in the sphere of consumption [Gardocka-Jałowiec, 2007, pp. 562-563].

The spatial system of consumption consists of the relations in and between the systems of consumption of economies. Their role is becoming more important under conditions of regional integration of various economies, and globalization of economy in general [Kielczewski, 2008, pp. 58-60]. Favourable changes in consumer awareness include the shaping of a system of values connected with an increasing tendency to economise, to ensure the development of future generations (including the maintenance the natural reserves for future generations).

3. Consumption as a phase of an economic process

Consumption as a phase of the process of circulation of commodities in sequence: production – distribution – exchange – consumption was analysed by K. H. Marx [Marx, 1986, pp. 43-48]. He believed that consumption is a premise of production. It constitutes its cause. It is a motivation for engaging in economic activity. Production, on the other hand, creates consumption by providing items of consumption, determining the ways of consuming, and shaping (by producing commodities) consumer needs. K. H. Marx clearly indicated the higher role of production over consumption. Consumption concludes the economic cycle (production – distribution – exchange – consumption), but today it also provides the rationale for yet another cycle.

Realization of economic activities requires, from a praxeological perspective, the use of at least two productive forces: (1) people representing various cultural, psychological traits and having different interests, and (2) things characterized by different physical parameters. Both can be accumulated and used in a specific place and point in time. However, it is not products that shape an economy but rather people – and their actions. Every economic event is, in its nature, a specific social reaction. Every event or economic action performed seemingly by a single individual has a specific influence not only on the performer and his material environment, but also – most importantly – has a social resonance. Their effects are felt by other people, even though their relationships and correlations do not have material forms [Meredyk, 2007, pp. 27-34].

Consumption *is a process of social communication of preferences and identity in which man's pursuit of achieving an objective of satisfying one's needs (existential, self-development, and social needs) by allocating limited consumption resources (financial and non-financial) ultimately leads to indirect effects (i.e. exceeding their spheres of benefits) important from the perspective of: (1) the desired model of social relations (including economic relations), (2) consistency and dynamics (rate) of development of productivity forces*[2]. This view on consumption is based on a praxeological (efficiency) approach. Therefore, when considering consumption, as an active element of the economic process, it is important to illustrate:

- consumer needs as goals in a direct and future perspective;
- consumption resources, or the means necessary to satisfy the needs;
- allocation of consumption resources;
- effects (results) of consumption.

[2] This definition is created for the purpose of present analysis.

Consumption needs

The aim of consumption is to satisfy needs. The appearance of a needs means a breach in the inner or outer balance of an individual. Breaching the outer balance means the relations between an individual and the outer physical or social environment. The restoration of thus balance is undoubtedly a dynamic and not a static phenomenon. The dynamics result from such features of needs as, renewability, limitlessness, intensity of experience, difference of degree of concentration, ability to develop and differentiate, seasonality, the relations and correlations between needs [Gajewski, 1994, pp. 39-41; Światowy, 2006; Zalega, 2008; Bywalec, 2010, pp. 14-19].

The synthesis of the features of needs entails their classifications. The hierarchization of needs was attempted by such figures as: W. S. Jevons, A. Marshall, C. Menger, E. Taylor, A. H. Maslow, C. P. Alderfer [Menger, 2007, pp. 52, 94-106; Maslow, 1990; Alderfer, 1972]. The differentiation of consumer needs, their permanent satisfaction is the fundamental reason for the difficulty of their general, objective hierarchization. The classification of needs presented in literature on the subject usually entails classification into lower and higher needs. One example of such division is the classification developed by United Nations Research Institute for Social Development for the Geneva method for studying the level of life.

Considering consumption as an activity which influences the shaping of social and human capital [Coleman, 1998; Schultz, 1976; Becker, 1975; Sirianni, Friedland, 1998; Fukuyama, 2007; Poskrobko, 2011] it is important to analyse the system of needs. By modifying C. P Alderfer's hierarchy of needs [*The ERG Theory*, 1972] it is important to illustrate existential needs, self-development needs, and social needs (the need of relationships according to C. P. Alderfer).

Existential needs are necessary to keep an individual alive. They are objective and commonly satisfied. Characterized by a consistency of preferences, they are the most important ones in the hierarchy. They can be associated with a commonly used term of basic needs.

Self-development and social needs start to emerge in the process of learning of an individual, in the environment and culture in which the individual lives and functions. These needs are flexible and compete with each other. To individuals, their appearance and strength depend on particular, subjective psychological states of individual and the relations with their environment. These are often equalled with secondary or higher needs.

It is believed that the determination of relationships at the level of appearing and satisfying the needs in the three presented groups forms the basis for creation of social and human capital:

- the need for self-development, social needs appear at relatively varied levels of phylogenetic and onto-genetic development of individuals;
- the scale of dominance of social and self-development needs is determined by the level of education, influence of the environment, material status;
- self-development and social needs have a lower meaning for the biological survival of individuals, meaning that their satisfaction can be belated;

- the satisfaction of self-development and social needs leads to the intellectual and emotional development of individuals, increase of individuality, creativity, self-realisation (satisfaction of basic needs does not entail such effects).

Analysing needs as a category which specifies the consumer activity in an economy, the following must be considered:

- strength and intensity of experiencing the needs is determined by a combination of endogenous and exogenous factors;
- the specificity of needs is their correlation with each other, but is also connected with their civilisation and technology environment;
- factors determining the structure of needs are a source of information about the changes which are taking place, or will take place in the future, and on the direction of these changes, that is the increase or decrease of their appearance;
- the structure of needs is shaped by primary choices (which need will be satisfied in what order) and secondary choices (the degree of distribution of resources between the needs);
- the temporal character of the structure of needs determines the necessity of constant observations and interpretation of the changes taking place in the near and far environment of individuals. Businesses cannot ground their activity on existing structure of needs. Such attitude will lead to a discrepancy between the market offer and expectations of individuals.

Consumption resources

Consumption resources can be understood as streams or as resources. In the resource understanding, the time aspect of consuming activity is omitted. Consumption resources should include financial and non-financial means. The rationality of their distribution leads to specific consumption effects. Therefore, what is important here is: the value, accessibility, and rapidity of circulation of consumption resources.

Financial resources of consumption include financial means obtained from internal sources (current and future market activity) and external sources (extraneous financing). Financial means from internal sources include income and savings, whereas external sources include all debt obligations (loans). Such perception of resources and their streams available for individuals are the condition for realizing consumer objectives, that is, the satisfaction of consumption needs. However, it is believed that: (1) the limit of possible realization of structure and level of satisfaction of needs of households is determined by internal sources of financing, mainly incomes; (2) streamlining the path of consumption (in conditions of fluctuating level of income) is done with internal and external sources of financing, namely by savings and loans.

The level of financing of consumption from external sources is determined by the current value of human and social capital embodied in man. It means that the degree of internal financing is determined by the income individuals makes by selling their abilities and skills in the labour market.

External financing is a complementary source to internal financing of consumption and can, but not necessarily, appear in the budged of households. The measure of capacity

for the use of external financing sources is the amount of achievable income. One important reason for supporting consumption with external financial sources is the disorder of satisfaction of consumer needs resulting from the instability of the level of manageable income, or the intensity of the influence of the phenomenon of mimicry (interpersonal influences leading to ostentatious consumption).

Non-financial resources of consumption include material and intangible resources. Material resources comprise of [Bywalec, 2010, p. 15]:

- durable consumer goods,
- material goods with symbolic meaning (cultural, religious items, such as sculptures, paintings, religious symbols).

Durable material goods are often substitutes for particular services, mainly those connected with leisure. Symbolic material goods, although they have a material structure, are not consumer items through their physicality, but rather through their intangible attributes. Increased purchase of these goods results from the occurrence of self-development and social needs.

Intangible resources, as parts of non-financial consumption means of consumption, are knowledge, qualifications, experience, level of trust, creativity (that is, elements of human capital and social capital), and time.

Knowledge is a specific product of the human mind. It is created in the process of personal and social development. Individual knowledge is created by: information and skills acquired through education, professional and life experience, intuition, ability process information and solve problems. Individuals have at their disposal resources of explicit knowledge and tacit knowledge [Nonaka, Takeuchi, 2000, pp. 84-85; Poskrobko, 2011, pp. 27-41]. Explicit knowledge is formally codified knowledge that is made public in the form of laws, formulas, principles, and is attainable through education, experience and training. It is easy to convey to other people and later generations. Tacit knowledge is, as opposed to explicit knowledge, often unconscious and difficult to convey. It develops under the influence of information and experience collected in life [Smith, 2001]. Tacit knowledge cannot be conveyed to other people and later generations. According to E.A. Smith, individual knowledge (both explicit and tacit) is the foundation of creative cooperation of teams, that is, for joint discussion, exchange of ideas, experience, and suggestions. Development of knowledge facilitates the development of the intellectual potential of populations [Poskrobko, 2011, pp. 27-41]. Consequently, there is an ongoing process of achieving higher stages of economic development and social life. Technologies develop and, as a result, civilisation progresses.

Allocation of consumption resources

Allocation of consumption resources is the assignment of those resources for the satisfaction of various existential, self-development, and social needs. The allocation capacity of households determines the amount and structure of consumption resources. The limitedness of consumption resources causes individuals to make choices – they make decisions to allocate the for the best development of the individual and society.

Activity of individuals should be based or rational distribution of consumption resources. Rational management means a behaviour that leads to a determination of

a set of consumption resources that optimise the satisfaction, assuming that the information is full and knowledge is perfect. In reality, information and knowledge is limited. Depending on the degree of the limitedness, there are various levels of transaction costs. Each decision is influenced by: systems of values, customs, or non-economic factors. Pure economic rationality in the case of the activity of individual objects of consumption is difficult to achieve.

The measure of allocation of consumption resources are consumption expenses. These expenses demonstrate the rate and quality of satisfaction of needs and the differences in the scale and level of distribution of income by households.

Changes in the structure of consumer expenses are the basis for the evaluation of the level and structure of satisfaction of needs (existential, self-development, and social needs) of individual objects of consumption, but it also enables the assessment of the development phase of consumption in an economy. As C. Bywalec [2010, p. 128] indicates, "The first phase of development of a household (or a society), when the level of its wealth and stream of running income is low, the structure of expenses is dominated by expenses on food, followed by industrial goods, and a lowest share presented by the purchase of services. As wealth increases, the first place becomes occupied by purchase of industrial goods, with food expenses falling to the second position; this second phase of consumption can be called an industrial phase (the phase of industrialisation of consumption). Finally, in the third phase of development, the largest part of income is spent on the purchase of services (servitisation phase of consumption), and the food expenses fall to the third position".

The phase of consumption may treated as a measure of the relative efficiency of the allocation of consumer resources. This means referring to other households and economies (in particular, those which are highly developed, whose consumption is a point of reference and aspiration for individuals and the society).

Effects of consumption

Effects of consumption should be understood as the consequences, results and roles of consumption. According to the criterion of the type of impact on the sphere of economy, there are direct and indirect effects of consumption.

Direct effects are felt during consumption or immediately after. They have a subjective character. The value of the effect is always assessed individually, and therefore has different amounts.

Indirect effects of consumption are further consequences of need satisfaction manifesting in the process of development of people – in their attitudes and behaviour. Indirect effects, as opposed to direct effects, are characterised by higher levels of development that renewal. They manifest in the process of development of individuals. In general, these do not activate immediately upon the conclusion of consumption. They are felt later, and longer, and, it can be said, between generations. The level of alternative costs therefore seem lower in the individual sphere, although it can be higher from the perspective of a society [Bywalec, 2010, pp. 16-17,108-115].

Consumption as an active element of the economic process generates indirect effects which have primary meaning for the environment manifested in the long term. These

include informative, motivation, and reproduction effects. Each of these effect has a direct and indirect influence on innovative activities.

When considering the reproductive effect of consumption, simple and expanded reproduction should be highlighted. The effects of expanded reproduction are the increase of qualifications, knowledge, and institutional conditions of economic activity of an individual and society. Growing intellectual potential of societies will increasingly influence faster achievement of higher stages of management stages (innovative activity), economic development, achieving the living standards by people, and widely perceived culture (including economic culture), and, ultimately, civilisation development [Olejniczuk--Merta, 2011, pp. 26-37].

The reproductive effect of consumption is strongly linked with the motivational effect of consumption. The development of needs, changes in their hierarchy resulting from the development of individuals (the want to increase their social status, level of life, or broadly perceived quality of life) motivate increased economic and social economy. High levels of motivational capital of individuals, societies translates into faster development of economic processes [Bywalec, 2010, pp. 108-115; Olejniczuk-Merta, 2011, pp. 26-37].

Informational effects of consumption should be mainly understood from the perspective of the effects consumption has on the market activity of businesses in this engaged in innovation.

4. Conclusions

Consumption as an active element of the economic process sets the conditions for the development of human capital and social capital. This means that it determines the condition of individuals – it impacts the efficiency of their work, the speed of work, intellectual efficiency, creativity, the ability to take risks. Moreover, it contributes to the formation and development of any type of relations between people based on institutional conditions (formal and informal). The process of consumption is always social in character, and particular acts of consumption should be perceived as a group of special social ties. Consumption is a social or a natural process, meaning that it is comprised both of the conciousness of the action and the action itself, independent from consciousness. At the same time, just like any other form of economic activity, consumption should be subjected to the influence of the rational factor, as much as possible.

A synthesis of the considerations shows that:

1. The key to the development of the economy is the identification and constant observation of needs, or specifically the determinants of exogenous and endogenous changes in the structure of needs. The identified exogenous and endogenous determinants are entry factors in the process of defining the opportunities and direction of the future activity in the private and public sector. And these should surely not be treated as constant, unchanged conditions.

2. Consumption resources in the possession of households determine the capacity of satisfying the existential, self-development, and social needs. These determine whether individuals stay alive, develop, and maintain interpersonal relations. The changes in the structure of consumption resources can have both a positive and negative influence on economic development. Increased saving, higher motivation for streamlining the consumer pathway, growing inclination for personal development, all these factors are favourable for economic development in the long-term. Opposite tendencies limit that development.
3. The allocation capacity of households result from the amount and structure of consumption resources. During consumption, available resources are transformed into values which facilitate the development of social and human capital. Therefore, managing limited consumption resources is mainly based on deciding about their allocation in the satisfaction of existential, self-development, and social needs. These decisions result from the hierarchy of needs that function in the consciousness of individuals, but also from their aspirations, expectations, and denials. In a household's balance of accounts, both economic and non-economic (and subjective) factors connect.
4. Effects of consumption, such as reproductive, motivational, and informational effects (indirect effects) manifest themselves in the long term. They have a positive influence on economic development.

In the economic process it is important to include social rationality (meaning internal and trans-generational justice) and the involvement of the public sphere in shaping conscious consumption. In other words, there is the need for actions that include long-term consequences, and actions aimed at the non-material aspect of consumption. The abundance of consumer goods with inadequate activity in terms of forming the conditions for a strong, intelligent and healthy society is a threat to global economy. This is a significant issue in the face of an aging society and changes in the structure of the population.

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Urszula GOŁASZEWSKA-KACZAN, Marek KRUK, Anna ŚLESZYŃSKA-ŚWIDERSKA[1]

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ECO-LABELLING AS A TOOL OF CSR: OPPORTUNITIES AND THREATS

Summary

Corporate Social Responsibility is a concept which, although it is developing for many years, it is constantly improved in both terms – theoretical and practical. In theory area are creating new definitions and new areas for action shots and in practice area are sought new instruments that could be used in pro-social activities. In this way, more and more expanding a set of tools that are available for socially responsible companies.

In this article will be discuss the eco-labeling, which is an instrument belonging to the traditional set of activities in the framework of CSR. Eco-labeling is relatively poorly described issue in literature. In practical area, we can also find deficiencies.

Analyzing the areas of corporate social responsibility calculated by ISO 26000, eco-labeling can be included into the area of the environment, fair operating practices and consumer issues. This shows how multi-dimensional issue is the use of eco-labeling. This fact creates the possibility of assessing this practices of different points of view - companies , consumers and the environment.

The purpose of this article is to identify opportunities and risks associated with the use of ecolabelling as a tool of CSR. In this article the authors will show that the activity in the area of eco-labeling not only builds the image of a socially responsible company, but also translates to specific business benefits. In addition, the authors will attempt to assess the proportion of customers for products marked with eco-labeling.

Analysis of the problem will be based on the available literature in the field of corporate social responsibility, marketing, sustainable development and environmental protection.

Key words:: ecolabelling, corporate social responsibility

1. Introduction

The modern business environment is continuously changing and becoming increasingly complex. It creates specific conditions for entrepreneurship, which include [Hancock, Korsten, Pohle 2003, p. 83.]:

[1] Dr hab. Urszula Golaszewska- Kaczan, prof. UwB – Faculty of Economics and Management, University of Bialystok, e-mail: ulakacza@o2.pl. Marek Kruk, Ph.D. – Faculty of Economics and Management, University of Bialystok, e-mail: marek.kruk@uwb.edu.pl. Anna Śleszyńska-Świderska, M.A. – Faculty of Economics and Management, University of Bialystok, e-mail: a.sleszynska@interia.pl.

- competitive Darwinism, involving steady and very strong pressure from direct and substitutive competition, as well as the ongoing emergence of new competitors;
- discontinuity of environment, which involves changing demand, technological innovation and sudden, dramatic alterations in government legislation;
- unrelenting financial pressure, requiring a growing and predictable revenue, which becomes an economic challenge and is expected by investors;
- unforeseeable threats – a universal hazard for international companies that are ever more vulnerable to natural disasters, unstable geopolitical situation, and other market shocks.

These circumstances force entrepreneurs to undertake specific actions in order to alleviate risk, diminish the threats, and at the same time enhance the competitive position of their companies. Y. Allaire and M. Firsirotu claim that in order to reduce the uncertainty and limit a company's sensitivity to external influence, managers can resort to the political method. It involves creating or controlling the future of a company through subordination or elimination of the sources of uncertainty. Among the tools used in the political method is social responsibility [Allaire, Firsirotu, 2000, p. 322].

The concept of corporate social responsibility arose from a new approach to objectives of a company and to the persons or groups in whose interests companies operate. Instead of being merely regarded as institutions established to pursue the interests of their owners, enterprises are gradually seen as places which should also satisfy the needs of other stakeholders. Social responsibility assumes that it is possible – and profitable – to undertake such actions which contribute to achieving social welfare goals, in the broad sense of the term. Moreover, those actions are voluntary in nature and go beyond the scope of legal provisions.

Companies can implement socially responsible measures within various areas and towards different stakeholders, using a wide range of instruments, methods, and techniques.

The purpose of the paper is to present eco-labelling as a tool of social responsibility and to indicate the benefits which could be attained from its use, both for companies and for various groups of stakeholders. The authors aim wish, among other things, to prove that socially responsible policies can not only improve the image of a company, but that they can also translate into tangible business outcomes.

The analysis is based on the available literature on corporate social responsibility, marketing, sustainable development, and environmental conservation.

2. Position of Eco-Labelling in the Concept of Social Responsibility

Corporate social responsibility has been for some time in the focus of research carried out by scholars from various fields of management. And yet, no universally accepted definition of the idea has been established. The first attempt at such a definition was made in 1933 by A. Carnegie in *The Gospel of Wealth* [Carnegie, 1993], where the author described social responsibility using the principles of charity and

stewardship. Over the following years, new approaches to the notion emerged. In particular, the 1970s and 1980s saw an increased number of endeavours to describe social responsibility. It is in that period that A. B. Carrol proposed that the concept encompassed the economic, legal, ethical, and discretionary responsibilities that society expected businesses to assume at a given time [Carroll, 1981, p. 50.]. The twenty-first century has brought a different interpretation of the term, not merely emphasising the types of obligations that companies have, but rather focusing on the dialogue with stakeholders. A formal definition provided by *Canadian Democracy and Corporate Accountability Commission* in 2001 states that the term denotes the overall relationship of a corporation with all of its stakeholders [*Canadian Democracy and Corporate Accountability Commission*, 2001, p. 132].

The scope of this paper is insufficient for an in-depth analysis of the evolving approaches to social responsibility. It should be noted, however, that the debate is still ongoing, which proves that the topic is both important and relevant, and that the changing circumstances in which businesses function make it necessary to reconsider the interpretation of the idea.

An attempt to standardise the definition of social responsibility was made in 2010, when the ISO 26000 norm was developed. The standard is designed to provide a uniform understanding of the term, irrespective of the conditions in which an enterprise operates.

According to the document, social responsibility is the responsibility of an organisation for the impact of its decisions and activities on the society and the environment, through transparent and ethical behaviour that [Electronic document, access mode: http://www.pkn.pl/iso-26000, retrieved: 15.10.2014]:

- contributes to sustainable development, including the health and the welfare of society;
- takes into account the expectations of stakeholders;
- is in compliance with applicable law and consistent with international norms of behaviour;
- is integrated throughout the organisation and practised in its relationships.

This approach assumes that the notion is relevant for all entities, regardless of their nature and mode of operation. As the website of the National Standards Body in Poland informs, social responsibility applies to all kinds of organisations: public, private and non-profit, notwithstanding size or location, both those functioning in developed and developing countries. Moreover, it is not limited to corporate social responsibility. This represents a step forward in comparison to the earlier definitions, which mostly associated social responsibility with business ventures. ISO 26000 also provides guidance to seven areas in which socially responsible activity may be undertaken [Electronic document, access mode: http://www.26k-estimation.com/html/user_guides_ iso_26000.html#user-guides, retrieved: 15.10.2014]. These include:

- organisational governance: management that takes into account social interest, rights of stakeholders, and social norms;
- human rights: respect for people and their dignity;
- labour practices: responsible management of human resources;

- environment: actions for the protection of the natural environment, in the broad sense of the term;
- fair operating practices: observing the principles of fair competition;
- consumer issues: honest and transparent behaviour of companies towards consumers;
- community involvement and development: actions for the benefit of local communities.

The present paper focuses mainly on 'consumer issues'. ISO 26000 enumerates the following [Electronic document, access mode: http://ecodialog.pl/sites/default/files/.discovering_iso_26000PL.pdf, retrieved: 15.10.2014]:

- Issue 1: Fair marketing, factual and unbiased information and fair contractual practices.
- Issue2: Protecting consumers' health and safety.
- Issue 3: Sustainable consumption.
- Issue 4: Consumer service, support, and complaint and dispute resolution.
- Issue 5: Consumer data protection and privacy.
- Issue 6: Access to essential services.
- Issue 7: Education and awareness.

The above are, of course, only examples of issues which in practice may be accompanied by a number of other endeavours.

Eco-labelling, which is the focus of the present paper, can be seen as part of Issue 1, i.e. as an element of unbiased information addressed to customers, as well as part of Issue 7, being an excellent means of educating customers and enabling them to make conscious and informed choices.

Interestingly, eco-labelling can also be analysed from the point of view of fair operating practices, since it is an instrument of ethical competition policy, and as a way to encourage protection of the environment and cleaner production.

3. The notion of eco-labelling

As mentioned earlier, the idea of eco-labelling is relevant to several important aspects of social responsibility. On the one hand, customers are provided with additional, although not legally required, information on products. On the other hand, it boosts the promotion of eco-friendly products, which is beneficial to the natural environment. Moreover, eco-labelling contributes to improving the standards of market competition.

The origin of eco-labelling can be traced back to the idea of using certain prefixes in front of product names, in particular such as 'eco-' or 'bio-'. The idea of using it wasn't correlated with meaning of this prefixes. From marketing point of view such a product should be identified by buyers as natural and ecological, so more healthy to the human body. Such a message expressed was not, however, explicit enough as customers' expectations were far more specific. It was in the 1970s when special

ecological markings started to be used on the least eco-unfriendly products. The principles of ecological certification were established by many international organisations, e.g. the European Communities, the World Trade Organisation (WTO), the United Nations Environmental Programme (UNEP), and the International Standardization Organisation (ISO). The first countries to introduce eco-labelling included: Germany (1978), Canada (1988), the Nordic Council States (1989), Austria (1991), and the Netherlands (1992).

The introduction of eco-labelling made it possible to achieve the following effects [Gallastegui, 2012, pp. 316-317.]:

1. the opportunity to emphasise the influence of consumption on the natural environment through appropriate, clear and informative labelling of products. The ability to create more sustainable consumption, thanks to the growing customer awareness;
2. the involvement of companies, governments and other institutions in developing more environmentally benign products;
3. the initiation of competitive processes based on using labels which provided customers with considerable added value.

Another upside of eco-labelling is that it provides comprehensive information on production, packaging, distribution, consumption, and waste management.

The various eco-labelling schemes can be classified into three broad types [OECD, 1997, pp. 9-10.]:

- type I labels indicate the quality of products in relation to the environment and in comparison with others in the same category; type I labels aim to encourage more sustainable consumption through the development of pro-ecological habits. These labels are voluntary and are awarded by third parties, often financially supported by governmental institutions. Their purpose is to certify that both the manufacturing process and the entire life-cycle of a product are respectful of the environment;
- type II labels are self-declarations made by producers, importers, or distributors to inform buyers about the environmental impact of goods, and refer to specific attributes of the products;
- type III labels, the least common ones, provide information on the quantitative aspects of products and are based on independently verified indicators.

Type I eco-labels are by far the most frequently used. This seems to be caused by the fact that they are granted by independent certifying institutions (unlike type II labels) and according to relatively straightforward certification criteria (very much in contrast to type III labels).

Eco-labelling can use a variety of criteria. Customers might regard the following as the most important [OECD, 1997, p. 126]:

- presence of toxic substances in products;
- presence of artificial additives in products;
- greenhouse gases emissions resulting from manufacturing, shipping and consumption of products;

- resources used in production process;
- waste generated as a result of production process;
- non-renewable resources used for manufacturing goods;
- the amount of energy needed for production;
- water pollution caused by production;
- geographical origin of products;
- geographical origin of resources;
- use of child labour;
- spatial location of production (local manufacturing).

Companies venture into eco-labelling schemes and bear the costs of certification procedures to be entitled to using the labels on their products because they count on certain benefits. The major potential advantages include the following [Gallastegui, 2012, p. 318.]:

- consumers, even if they wish to learn about the environmental impact of a product, do not devote much time to searching for relevant information, and thus are willing to trust a label which is reliable and which meets their expectations;
- appropriate labelling, satisfying the preferences of buyers, can help to boost the image of a company and lead to an increase in the volume of sales;
- labels can draw the buyers' attention to environmental issues;
- participation in eco-labelling schemes can prompt direct involvement in nature conservation activities

From this point of view, eco-labelling represents a tool for achieving a competitive advantage over products which are not marked with ecological labels.

The positive influence of eco-labelling is also evident on the social level. The following benefits should be emphasized [Electronic document, access mode, https://www.iisd.org/business/markets/eco_label_benefits.aspx, retrieved: 18.09.2014]:

1. Facilitating consumer choices.
   Eco-labelling is an efficient way to inform customers about the environmental impact of selected products. It enables people to discriminate against products which are harmful to the environment and to choose those which are more compliant with environmental protection requirements. Eco-labelling raises customers' awareness of the benefits of certain products in terms of, e.g., energy efficiency or waste reduction.
2. Promoting economic efficiency.
   Eco-labelling is usually less costly than regulatory investigations. By allowing customers and manufacturers to take ecologically responsible decisions, the need for formal regulations is reduced to a minimum. This is advantageous both for the government and for the industry.
3. Stimulating market development.
   When customers choose ecological goods, they directly influence supply and demand for these products, sending a signal to the market that being ecologically conscious is profitable.

4. Encouragement for continuous improvement.
   The dynamic market for eco-labelled products encourages manufacturers to keep improving the state of the natural environment. Customers can expect that the negative impact of industrial products on the environment will gradually be lessened.
5. Promotion of certification.
   Certification schemes confirm that products meet specific ecological standards. They provide customers with tangible evidence for the advisability of consumption from the viewpoint of environmental protection. Therefore, certification helps educate customers and strengthens competition mechanisms among manufacturers. Because certified products are easily identifiable by visible logos, they stand out on shop shelves.
6. Assistance in monitoring
   Another benefit of official eco-labelling programmes is the fact that all kinds of irregularities are easier to detect. This is convenient for both competitors and customers because they are better able to assess the validity of potential damages action.

The phenomenon of eco-labelling is an ambiguous one. It can be regarded from various points of view. Nevertheless, its effectiveness always depends on the consumers, whose perception and experience allow them to variously evaluate eco-labelled products and thus modify their market behaviour towards this type of goods.

4. Consumer attitudes towards eco-labelling

Both theoreticians and practitioners have long been exploring the factors that shape the behaviour of consumers. Just several years ago, it was underlined that price and quality were the key determinants which influenced purchase decisions, closely followed by brand loyalty. Although price and quality do remain significant factors, the steady trend towards ecologically sound consumption that finds its embodiment in actions for reducing environmental impact causes a rise in the role of other considerations.

Eco-labelling can, therefore, become a sort of marketing strategy aimed at the promotion of sustainable consumption based on natural products whose manufacturing is consistent with the principles of conservationism. Furthermore, eco-labels are a marketing tool which can be used to stimulate the development of organic products market [Atănăsoaie, 2013, p. 122.].

An analysis of the marketing side of eco-labelling should acknowledge that it is also identified with the concept of social marketing, whose objective is to support initiatives intending to solve social problems [Cooper, Ludlow, Clift, 2012, p. 36.] such as, e.g. the preservation of natural resources for future generations.

However, if eco-labelling is to fulfill its functions, it must be intelligible to customers. Unfortunately, information concerning the environmental impact of prod-

ucts reaches customers from many sources and can be incoherent or contradictory. Consumers who are overwhelmed by confusing messages might, as a result, make incorrect decisions and buy non-ecological products, in spite of the best intentions to purchase environmentally friendly ones [Electronic document, access mode: http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/swd/2013/0112/COM_SWD(2013)0112_PL.pdf, retrieved: 10.10. 2014].

In order to take full advantage of the potential of eco-labelling, firms and institutions which venture to certify their products and services must focus on activities that would influence customers during the actual purchasing process [Atănăsoaie, 2013, p. 125.]. The first objective is to arouse interest, which should be a consequence of educational efforts directed at buyers to raise their awareness of the benefits signified by particular labels. In many countries, several eco-labels are present in the market, which allows consumer to find out what each of them means. Besides, they need to have knowledge about the criteria that must be met to obtain the right to use each label. When the values behind eco-labels are properly understood, they gain credibility, which is then transferred on the labelled products. Any difficulties to read and interpret an eco-label can discourage the potential buyers of the products they mark and even inspire aversion towards eco-labelling as such.

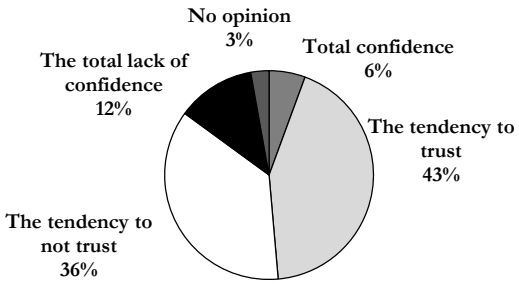
However, those eco-labels which are familiar to customers and generate favourable associations increase customers' readiness to make a purchase, enhance the buyers' perception of a product's quality, and lower the sensitivity to price (which is usually higher than in the case of similar, but unlabelled goods). If customers are provided with necessary and reliable information regarding eco-labelling, they will be more likely to purchase an eco-product [Bostrom, Klintman, 2011, pp. 35-38.] and more willing to pay attention to the label the product comes with. Bona fide information on eco-labels seems to be, therefore, a signal sent to consumers and prompting them to select ecologically-branded products [Dočekalová, Straková, 2011, p. 1248.].

Consumers' attitudes vary widely: some value only those labels which comply with strict standards, for others the important thing is whether the certification is granted by an institution involved in environmental protection, by an industry, or by the government. The attitude adopted by consumers can affect their purchase intentions. The higher the awareness of the benefits gained from buying eco-labelled products, the stronger the accompanying intentions. If the product meets the expectations, further purchases can be anticipated, reinforced by the conviction of its positive impact on the buyer and his or her family, as well as other people and the natural environment. In this situation, loyalty towards products labelled as ecological is created, which is interpreted as a positive effect of eco-labelling.

Constructing the ecological awareness among consumers is a long-term, and quite difficult, process. It requires educational efforts targeted at the youngest generations. According to the theory of consumer behaviour, people are reluctant to alter their habits and preferences related to consumption. This is why it is so vital to begin shaping the ecological awareness among the youngest consumers and to continue doing so in their later years, increasing the chance that many buyers will, before acquiring a product, carefully reflect on its environmental impact.

The results of a 2012 research conducted by Eurobarometer entitled 'Attitudes of Europeans towards building the single market for green products' demonstrate that in the entire EU, 80% of the consumers buy eco-labelled products, and are eager to buy more. Upwards of a half of the purchasers (54%) are occasional buyers, while fewer than a guarter (26%) regularly acquired ecological products. Meanwhile, only 15% of the consumer did not buy eco-labelled goods at all. As many as 95% of those who purchase ecological products were of the opinion that they contributed to environmental conservation. What is more, 55% emphasised that those products were relatively good value for money [Electronic document, access mode: http://ec.europa.eu/public_opinion/flash/fl_367_sum_en.pdf, retrieved: 11.10.2014].

CHART 1.
Trust of European consumers towards information on environmental impact provided by green product labels in 2009 (in%)



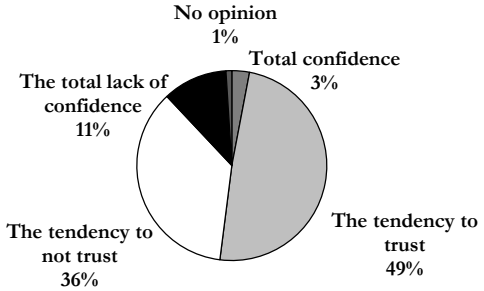
Source: author's own work based on [electronic document, access mode: http://ec.europa.eu/public_opinion/flash/fl_367_sum_en.pdf, retrieved: 11.10.2014].

Although a large percentage of the surveyed consumers declared that they bought eco-labelled products, a substantial number of them did not actually believe the environmental impact information given on the labels of green products (see Graphs 1 and 2). An ideal consumer does not need eco-labelling to know whether a product is environmentally sound. He or she is like a fashion connoisseur, capable of recognising quality items without having to consult the labels. For ordinary customers, however, eco-labelling is like a handbook which they need to guide them in their decision-making. What adversely affects people's attitudes to eco-labelling is distrust towards the information eco-labels convey. An average consumer may find it difficult to judge, merely by looking at the label, which products are less harmful to the environment. That is why trust is absolutely central to the idea of eco-labelling [Dočekalová, Straková, 2011, p. 1249].

In 2012, just above a half of the consumers trusted the information they found on product labels (52%). Compared to 2009, this is but a slight increase (3 p.p). In 2012,

nearly half of the consumers did not trust eco-labels (47%), which accounts for a mere one-percentage points drop in relation to 2009.

CHART 2.
Trust of European consumers towards information on environmental impact provided by green product labels in 2012 (in %).



Source: author's own work based on author's own work based on [Electronic document, access mode: http://ec.europa.eu/public_opinion/flash/fl_367_sum_en.pdf, retrieved: 11.10.2014].

The distrust of eco-labels is primarily caused by the incomprehensibility and insufficiency of information placed on products. Almost six out of ten of the surveyed European consumers (59%) believed that labels do not provide enough information regarding the environmental impact of products, and thus there were no grounds to regard them as fully ecological. Furthermore, one third of EU consumers (32%) thought that eco-labels on some products were unclear and illegible [Electronic document, access mode: http://ec.europa.eu/public_opinion/flash/fl_367_sum_en.pdf, retrieved: 14.10.2014].

As a result, there is a growing conviction among consumers that enterprises simply compete with one another in terms of information included in eco-labels, instead being of genuinely involved in environmental efficiency [Electronic document, access mode: file:///C:/Users/Enigma/ Downloads/COM_2013_196_PL_ACTE_f.pdf, retrieved: 14.10.2014].

Customer awareness of the existence of an eco-label is a necessary condition for the label's effectiveness in the purchase decision-making process. This awareness means that consumers realised that such a label exists, what it looks like, and what it means. Recognising an eco-label is not tantamount to understanding its significance. Consumers will take an eco-label into consideration in purchasing decisions only when it inspires their confidence. Many surveys suggest that consumers are sceptical about eco-labels. What is interesting, they are more willing to take them into account in the decision-making process if the information they include comes from public and other independent sources, rather than from the sellers and manufacturers. Apart from trust and awareness, another necessary condition for a positive attitude towards eco-labelling is the belief that paying attention to ecological markings helps buyers achieve their own

goals associated with purchasing a given product [Electronic document, access mode: [Thogersen, 2000, pp. 288-289.].

A survey commissioned by the Ministry of the Environment, and conducted by PBS in 2013, reveals that a majority of Polish consumers hardly ever took any notice of the ecological labels on the products they bought (Table 1).

Analysis of the data from Table 1 shows that between the years 2011-2012 and 2013 the proportion of consumers who did not pay any attention to ecological labelling increased, while the percentage of those who did so always and often grew slightly. Overall, it can be said that more than one third of the consumers had a habit of noticing eco-labels on products. The results of the 2013 survey do not differ in any significant way from the outcomes of the 2011-2013 study.

TABLE 1.

Consumers who paid attention to ecological and environmental labels when making purchases; years 2011-2013 (in %)

Year	Respondents' replies to question: How often do you pay attention to ecological and environmental labels (in the context of shopping and				
	Always	Often	Rarely	Never	Hard to say
2013	6	30	39	23	2
2012	6	30	37	23	4
2011	5	29	42	19	4

Source: author's own work based on: [Electronic document, access mode: https://www.mos.gov.pl/g2/big/2013_12/ee41d9c93bc700729faf03103120a38c.pdf, retrieved: 14.10.2014].

Consumers' attitude towards eco-labelling depends on a number of factors, such as age, education, place of residence. These interdependencies are presented in Table 2.

TABLE 2

Percentage of consumers who paid attention to eco-labelling according to selected socio-demographic characteristics (in 2013)

Characteristic						
Age	**15-19 years**	**20-29 years**	**30-39 years**	**40-49 years**	**50-59 years**	**60 years and more**
	43	**31**	**40**	**43**	**35**	**30**
Educational level	Primary	Vocational	Secondary	University	-	-
	34	26	40	50	-	-
Place of residence (number of inhabitants)	Village	Town up to 20,000	Town 20,000 - 100,000	Town 100,000 - 500,000	Town above 500,000	-
	36	47	41	30	30	-

Source: author's own work based on: [Electronic document, access mode: https://www.mos.gov.pl/g2/big/2013_12/ee41d9c93bc700729faf03103120a38c.pdf, retrieved: 14.10.2014].

Analysis of Table 2 reveals that ecological markings on products were most frequently noticed by the youngest consumers, aged 15-19 (43%), and those aged 40-49 (43%), with university education and living in towns inhabited by more than 20,000 people. The customers who took the least notice of eco-labels comprised persons aged 20-29 (31%), with vocational education (26%), and those who lived in towns with more than 100,000 inhabitants.

Moreover, a 2012 survey into customer attitudes proved that it is men rather than women that were more often indifferent to eco-labelling: only 20% of them paid attention to ecological labels (26% of the women). Also, the less well-off consumers failed to check whether the products they bought had eco-labels (35%). Those whose financial situation was better were ready to pay more for eco-labelled goods (only 8% of them had never done it), and did so more frequently than the less wealthy [Electronic document, access mode: https://www.mos.gov.pl/g2/big/2012_11/037ac15934792054904ccafce588677c.pdf, retrieved: 16.10.2014].

To conclude, it can be said that consumers constitute a force to be reckoned with and can exert considerable influence on enterprises as far as eco-labelling is concerned. Although using ecological labels is voluntary, by choosing environmentally friendly goods consumers can encourage manufacturers to increase their efforts to obtain ecological certification for their products. In this way, ecological attitudes can be enhanced not only by the fact that some consumers purchase eco-labelled products, but also by that fact that producers make use of eco-labelling.

Consumer opinions on eco-labelling may vary, but it can certainly be said that a growing number of people are ready for a radical change in consumption patterns in order to minimize its negative impact on the environment [Bostrom, Klintman, 2011, p. 1-2.], and that the attitude towards eco-labelling will consequently improve. It is essential that consumers are continually informed about ecological labels that can be found on retail items and about their meaning. Moreover, they should be assured that eco-labelled products do not necessarily have to be more expensive and that not all companies exploit eco-labelling as a competition tool.

5. Conclusion

To sum up, it must be said that eco-labelling is an important instrument for socially responsible business. Its application can bring benefits to customers, the natural environment, and companies themselves. One should note, however, that for these benefits to be achieved, an educational campaign is needed both to raise public awareness as regards conservation of the environment and to familiarise a wider audience with the signals conveyed by eco-labels. As research indicates, in spite of the fact that many European consumers purchase eco-labelled products, a large number of them do not believe in the credibility of the provided information. It seems, therefore, necessary that consumers become better acquainted with the process of acquiring ecological certificates and the requirements which must be met by companies wishing to obtain the right to use eco-labels. As for Polish consumers, who often entirely disregard ecological

markings, it seems crucial that general knowledge of environmental issues is reinforced. Only after these obstacles have been overcome, will it be possible for eco-labelling to fulfill the functions which are attributed to it.

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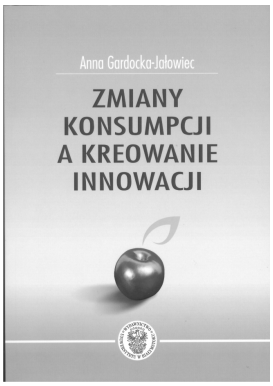

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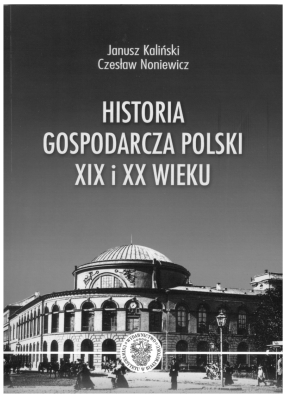
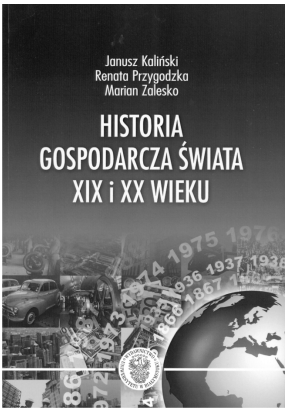


Janusz Kaliński, Czesław Noniewicz

HISTORIA GOSPODARCZA POLSKI XIX I XX WIEKU

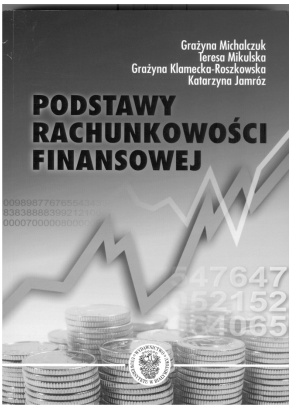
Białystok 2015, ISBN 978-83-7431-467-1



Janusz Kaliński, Renata Przygodzka, Marian Zalesko

HISTORIA GOSPODARCZA ŚWIATA XIX I XX WIEKU

Białystok 2014, ISBN 978-83-7431-381-0



Grażyna Michalczuk, Teresa Mikulska,
Grażyna Klamecka-Roszkowska, Katarzyna Jamróz

PODSTAWY RACHUNKOWOŚCI FINANSOWEJ

Białystok 2012, ISBN 978-83-7431-299-8

PODYPLOMOWE STUDIA RACHUNKOWOŚCI I AUDYTU WEWNĘTRZNEGO W JEDNOSTKACH SEKTORA PUBLICZNEGO

15-062 Białystok
ul. Warszawska 63
pok. 208

tel. (085) 7457702,
fax (085) 7457702

Kierownik: dr hab. Ryta I. Dziemianowicz, prof. UwB
Sekretariat: Grażyna Majewska

CEL STUDIÓW

- zdobycie i pogłębienie wiedzy z zakresu organizacji i funkcjonowania sektora finansów publicznych,
- pogłębienie wiedzy w zakresie prawa finansów publicznych i administracji publicznej,
- przekazanie słuchaczom wiedzy na temat szczególnych zasad i metod prowadzenia rachunkowości w jednostkach sektora finansów,
- poznanie nowych regulacji dotyczących organizacji i zasad przeprowadzania wewnętrznej kontroli finansowej w jednostkach sektora finansów publicznych,
- zdobycie praktycznych umiejętności w zakresie tworzenia oraz analizy funkcjonowania i oceny komórek kontroli finansowej i audytu wewnętrznego.

STUDIA ADRESOWANE SĄ DO:

- głównych księgowych i kadry kierowniczej w jednostkach sektora finansów publicznych
- pracowników odpowiedzialnych za prowadzenie nowoczesnego systemu audytu wewnętrznego i kontroli finansowej w jednostkach sektora publicznego.

Zasady naboru:

- decyduje kolejność zgłoszeń.

Warunki rekrutacji:

- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA FINANSÓW I RACHUNKOWOŚCI PRZEDSIĘBIORSTW

15-062 Białystok
ul. Warszawska 63
pok. 208

tel. (085) 7457702,
fax (085) 7457702

Kierownik: dr hab. Ryta I. Dziemianowicz, prof. UwB
Sekretariat: Grażyna Majewska

Podyplomowe Studia Finansów i Rachunkowości Przedsiębiorstw istnieją od roku akademickiego 1992/1993. Przeznaczone są dla absolwentów szkół wyższych różnej specjalności.

Celem studiów jest przygotowanie kadr dla przedsiębiorstw i instytucji w zakresie finansów i rachunkowości oraz przygotowanie słuchaczy do działalności usługowej w zakresie prowadzenia ksiąg rachunkowych.

Studia trwają dwa semestry, kończą się zaliczeniami lub egzaminami z poszczególnych przedmiotów. Zajęcia odbywają się w formie 7 dwudniowych zjazdów w weekendy w każdym semestrze i obejmują ponad 300 godz. zajęć dydaktycznych. Studia kończą się wydaniem świadectwa ukończenia studiów podyplomowych.

Wykładane są następujące przedmioty:
- rachunkowość finansowa,
- sprawozdawczość finansowa,
- rachunek kosztów,
- system podatkowy,
- papiery wartościowe,
- prawo cywilne, gospodarcze i administracyjne,
- system informatyczny i podstawy informatyki,
- wykłady okolicznościowe.

Zasady naboru:
- decyduje kolejność zgłoszeń.

Warunki rekrutacji:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA MENEDŻERSKIE

✉ 15-062 Białystok
ul. Warszawska 63
pok. 229

☎ tel. (0~85) 745 77 25
fax (0~85) 741 46 85

Kierownik: **dr hab. Tadeusz Truskolaski, prof. UwB**
Sekretariat: **Anna Kitlasz**

Podyplomowe Studia Menedżerskie istnieją od roku 1992. Przeznaczone jest dla absolwentów szkół wyższych, różnych specjalności.

Wykładowcami są pracownicy naukowi oraz praktycy, dyrektorzy banków i specjaliści z poszczególnych dziedzin. Program i treści nauczania dostosowane są do potrzeb i wymagań rynku. Studium daje szansę nawiązania ciekawych kontaktów oraz konsultacji z wieloma specjalistami z różnych branż.

Zasady naboru: decyduje kolejność zgłoszeń.

Warunki rekrutacji:

- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

Studia trwają dwa semestry. Zajęcia odbywają się w formie 2-dniowych zjazdów (w soboty i niedziele) i obejmują 256 godzin zajęć dydaktycznych. Studia kończą się egzaminem i wydaniem świadectwa ukończenia studiów podyplomowych.

Wykładane są następujące przedmioty:

- Organizacja i zarządzanie
- Zarządzanie finansami i rynek kapitałowy
- Marketing
- Zarządzanie zasobami pracy
- Zarządzanie strategiczne
- Biznes plan
- System podatkowy
- Funkcjonowanie gospodarki rynkowej
- Rachunkowość zarządcza
- Negocjacje w biznesie
- Public relations
- Prawo pracy
- Zamówienia publiczne
- Rynek i wycena nieruchomości
- Zajęcia komputerowe
- Seminaria - wykłady okolicznościowe

PODYPLOMOWE STUDIA
ZARZĄDZANIA PROJEKTAMI UNII EUROPEJSKIEJ

15-062 Białystok, ul. Warszawska 63, pok. 234,
tel. (085) 7457721, fax (085) 7414685

e-mail: kpeirg@uwb.edu.pl
http://www.weiz.uwb.edu.pl/

Kierownik: **dr hab. Marek Proniewski, prof. UwB**
Sekretariat: **mgr Jolanta Wiszniewska**

Cele studiów
Przekazanie praktycznych umiejętności opracowania projektu i jego zarządzania (w tym finansowego) oraz wypełniania wniosków, gwarantujących pozyskanie środków finansowych z Unii Europejskiej.

Adresaci
Wszystkie osoby, które są zobowiązane lub pragną z tytułu potrzeb lub planów zawodowych otrzymać wiedzę dotyczącą pozyskiwania środków finansowych z Unii Europejskiej.
W szczególności program kierowany jest do:
- przedsiębiorców,
- pracowników administracji samorządowej, organizacji pozarządowych,
- nauczycieli
- absolwentów szkół wyższych
- i innych osób zamierzających uzyskać kwalifikacje niezbędne do pozyskiwania środków finansowych z UE

Korzyści
Przygotowanie specjalistów w dziedzinie zarządzania projektami Unii Europejskiej. Studia dają możliwość nawiązania kontaktów z osobami bezpośrednio zaangażowanymi w realizację projektów finansowanych z funduszy strukturalnych

Zasady naboru: decyduje kolejność zgłoszeń.
Należy złożyć następujące dokumenty:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA
WYCENY I GOSPODARKI NIRUCHOMOŚCI

Specjalności:
WYCENA NIERUCHOMOŚCI
ZARZĄDZANIE NIERUCHOMOŚCIAMI
POŚREDNICTWO W OBROCIE NIERUCHOMOŚCIAMI

Kierownik Studiów:
dr Dorota Wyszkowska
e-mail: d.wyszkowska@uwb.edu.pl

Sekretariat:
mgr Jolanta Wiszniewska
tel. 085 745 77 21
fax 085 741 46 85
e-mail: kpeirg@uwb.edu.pl

CEL STUDIÓW:
Celem Studiów jest przygotowanie słuchaczy, **w zależności od wybranej specjalności**, wykonywania zawodu. W przypadku Wyceny nieruchomości celem studiów jest także przygotowanie do ubiegania się, po spełnieniu dodatkowych wymogów (praktyki zawodowe), o uzyskanie uprawnień zawodowych (egzamin państwowy).

Uczestnikami Studiów mogą być absolwenci szkół wyższych.

Studia trwają 2 semestry od października do czerwca w wymiarze godzin określonym w programie studiów. W przypadku specjalności Wycena nieruchomości program zgodny jest z minimum programowym zalecanym przez Ministerstwo Infrastruktury i Rozwoju, zawartym w Rozporządzeniu Ministra Infrastruktury i Rozwoju z dnia 12 czerwca 2014 r. w sprawie minimalnych wymogów programowych dla studiów podyplomowych w zakresie wyceny nieruchomości (Dz. U. z 24 czerwca 2014 r., poz. 826).

Zajęcia odbywają się w 2-dniowych zjazdach (soboty i niedziele) co 2 tygodnie i kończą się egzaminem.

Więcej informacji: http://www.weiz.uwb.edu.pl/studia-podyplomowe/studia-podyplomowe-wyceny-i-gospodarki-nieruchomosciami.html

Zasady naboru:
o przyjęciu decyduje kolejność zgłoszeń

WYMAGANE DOKUMENTY:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA ZARZĄDZANIA ZASOBAMI LUDZKIMI

15-062 Białystok
ul. Warszawska 63, pok. 225
tel. (085) 745-77-19,
fax (085) 741-46-85
e-mail: agrzes@ uwb.edu.pl
http://www.weiz.uwb.edu.pl

Kierownik: dr Anna Grześ

CEL STUDIÓW:
Przekazanie specjalistycznej wiedzy teoretycznej i praktycznych umiejętności z zakresu zarządzania zasobami ludzkimi niezbędnych do skutecznego funkcjonowania organizacji.
Zakres ten obejmuje m.in.:

- zasady i metody rekrutacji i selekcji,
- system ocen pracowniczych,
- systemy wynagradzania,
- prawo pracy i zbiorowe stosunki pracy,
- negocjacje zbiorowe,
- zarządzanie karierami i rozwojem pracowników, itp.

ORGANIZACJA STUDIÓW:
Studia trwają 2 semestry. Obejmują 188 godzin dydaktycznych. Zajęcia odbywają się w 2-dniowych zjazdach (w soboty i niedziele) co 2 tygodnie i kończą się obroną pracy dyplomowej oraz wydaniem świadectwa ukończenia studiów podyplomowych.

STUDIA ADRESOWANE SĄ DO:

- kadry kierowniczej przedsiębiorstw,
- pracowników działu kadr,
- osób zainteresowanych zdobyciem oraz pogłębieniem wiedzy z zakresu problematyki zarządzania zasobami ludzkimi w nowoczesnych organizacjach.

WYMAGANE DOKUMENTY:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

Zasady naboru:

- decyduje kolejność zgłoszeń.