Final Report - Abridged Version

University and Industry Collaboration as a Factor Enhancing Innovation in the Lodz Region

Lodz 2013
SPIS TREŚCI

Introduction (J.Różański) ........................................................................................................... 4

Chapter I (A. Kuna-Marszalek, R. Lisowska)
University and Industry Collaboration – Studies Review .................................................... 7
  1. Motivation for University and Industry Ties ................................................................. 8
  2. Factors Favouring Cooperation ................................................................................... 10
  3. Types of Cooperation .................................................................................................... 11
  4. Barriers to University Collaboration ........................................................................... 12
  5. Proposals to Improve University – Industry Collaboration ........................................ 13

Chapter II (J. Marszałek, D. Starzyńska)
Innovation Performance of Firms in Lodz Region – Results of Empirical Studies ................. 15
  1. Innovation Performance of Firms in Lodz Region Against the Performance of the Rest of the Country .............................................................. 15
  2. Characteristics of Enterprises Covered by the Study .................................................. 16
  3. Innovation Performance of Enterprises in the Lodz Region ......................................... 18
  4. Conclusions .................................................................................................................. 21

Chapter III (M. Jasiniak, J. Trippner-Hrabi)
University – Industry Collaboration in the Lodz Region Results of Studies ...................... 22
  1. Cooperation with External Research Units ................................................................. 22
  2. Barriers to cooperation and directions of their elimination ...................................... 25
  3. Future Plans for University and Industry Collaboration in the Lodz Region .............. 26

Chapter IV A. Kuna-Marszalek, R. Lisowska, J. Marszalek)
Assessment of the Existing Information Exchange System between Science and Business Sectors in the Lodz Region against Solutions Applied in the United Kingdom and other European Countries ........................................... 29
1. University and Industry Collaboration: Knowledge and Technology Transfer in the Lodz Region ...............................................................29

1.1. Scientific and Research Potential in the Lodz Region .................29

1.2. Current Solutions in University and Industry Collaboration

   In the Lodz Region – Selected Examples ........................................30

1.2.1. Innovation Centre – Technology Accelerator of the

        of the Foundation of the University of Lodz .................................30

1.2.2. Incubator of the University of Lodz ........................................30

1.2.3. Centre for Technology Transfer at the University of Lodz............30

1.2.4. Technology Transfer Department at the Lodz University

        of Technology ..................................................................................31

1.2.5. Centre of Innovation and Technology Transfer at the Medical

        University of Lodz ............................................................................32

1.2.6. Arterion – Foundation for the Support to Entrepreneurship

        and Science ..........................................................................................32

1.2.7. Lodz Regional Part of Science and Technology – Techno Park ....32

1.2.8. Lodz Knowledge Transfer Platform .............................................33

1.2.9. Technology Scouting ........................................................................33

2. System of University and Industry Collaboration in Innovation

   In Selected European Countries – Good Practices .............................33

2.1. United Kingdom ................................................................................33

2.2. Spain ..................................................................................................34

2.3. Germany ............................................................................................35

3. Assessment of the Existing System of University and Industry

   Collaboration in the Lodz Region ..........................................................36

Chapter V (J.Różański, D.Każmierczak)

Assessment of Barriers to Innovation Implementation in the Companies

In Lodz Region and their Cooperation with Research Centres Compared
to Solutions Applied in the United Kingdom ........................................37

   1. Theoretical Background for Barriers to University and Industry

       Collaboration ..........................................................................................37
2. Existing Barriers to University – Industry Collaboration to Poland .......38
3. University and Industry Collaboration in the Lodz Region ...............40
4. Barriers to University and Industry Collaboration
   in the United Kingdom........................................................................41
5. Potential and Opportunities of University and Industry Collaboration
   Taking Account of the British model......................................................42

Chapter VI (J.Różański, E.Gwarda-Gruszczyńska)

Recommendations for the Lodz Region in respect of University
and Industry Collaboration........................................................................45

1. Recommendation for Enterprises .......................................................45
2. Recommendation for the Science Sector.............................................47
3. Recommendation for Regional Authorities.........................................49

Summary (J.Różański) .............................................................................55
INTRODUCTION

The publication presents the results of literature review and empirical studies conducted within the research project „University and industry collaboration as a factor enhancing innovation in the Lodz Region” conducted between 1.10.2011 and 30.09.2013 by a research team consisting of researchers from the University of Lodz. Project beneficiary was the Foundation of the University of Lodz. The project was delivered within the framework of Operational Programme “Human Capital” Priority Axis VIII, „Regional human resources for the economy”, measure 8.2 „Knowledge transfer”, sub-measure 8.2.1 „Support to university and industry collaboration”. The intermediary institution for the Project and the commissioning party was the Marshal Office in Lodz. There was a cross-border element to the Project, the foreign partner was the Manchester Institute of Innovation Research, University of Manchester.

Foreign partner was not selected by chance. The University of Manchester is one of the leading research units in Europe when it comes to university and industry collaboration and issues relating to innovation in companies.

Project partner was represented by a team of research workers including: Elvira Uyarra, Kieron Flanagan, Kurt Allman, Fumi Kitagawa; organisational issues were taken care of by Debora Cox.

These were regional studies covering the Lodz Region and, more precisely, university and industry collaboration in it.

Project Manager was Prof. Jerzy Różański, his deputy was Dorota Starzyńska Ph.D., followed by Renata Lisowska, Ph.D. Cooperation with the foreign partner was coordinated by Magdalena Jasiniak, Ph.D. and organisational matters were looked after by: Anna Kobierecka, M.A. in Economics, Zuzanna Słomczewska M.A. in Economics, and Bożena Marciniak M.A. in Economics.

Studies were conducted by Jakub Marszałek, Ph.D., Aneta Kuna-Marszałek, Ph.D., Edyta Gwarda-Gruszczynska, Ph.D., Damian Kaźmierczak, M.A. in Economics, Jadwiga Kaczmarska-Krawczak, Ph.D in Economics, Justyna Trippner-Hrabi, Ph.D. in Economics, and Robert Walasek, Ph.D.

The following collaborated with the research team: Prof. Eugeniusz Wojciechowski, Prof. Wiesława Warzywoda-Kruszyńska, Prof. Witold Kasperkiewicz, Prof. Remigiusz Kozłowski, Prof. Wojciech Nowak, and Pawel Sekuła, Ph.D.

The publication includes several chapters.

Chapter I – „University and Industry Collaboration” is the review of Polish and international literature on cooperation between science and business, with special
attention paid to the analysis of factors conducive to or hampering initiating and continuing university and industry collaboration and possibilities of choosing various forms of cooperation. The Chapter also includes literature review with concrete suggestions how to improve collaboration between science and business sectors.

Chapter II under the title „Innovation Performance of Firms in Lodz Region – Results of Empirical Studies” is drafted based on the results of questionnaire studies conducted among entrepreneurs from the Lodz Region. Its first part includes considerations on innovation, its types and sources, and the comparison of innovation performance of companies from different regions in Poland. Then, it focuses on firms from the Lodz Region, which are analysed according to various criteria (size, origin, organisational and legal setup, sector of activity, structure of capital) and described from the viewpoint of innovation.

Chapter III – „University and Industry Collaboration in the Lodz Region – Results of Studies” presents results of questionnaire studies, which focused on cooperation between firms and science. It identifies relationships between the readiness of companies to cooperate with research sector and their specific features (structure of capital, size, scope and types of activity). The Chapter is a review of cooperation arrangements the most common types for the Lodz Region and of the frequency of contacts between business and universities. We analysed benefits of university and industry collaboration. Respondents also identified the most frequently faced barriers to cooperation. Final part of the Chapter discusses planned cooperation between companies and science sector.

Chapter IV - „Assessment of the Existing Information Exchange System between Science and Business in the Lodz Region against Solutions Applied in the United Kingdom and Other European Countries” is a detailed analysis of the research potential of the Lodz Region concentrated in universities and research units also in comparison to the rest of the country.

It presents units, which support university and industry collaboration (Innovation Centre Technology Accelerator of the University of Lodz, Incubator of the University of Lodz, Centre for Technology Transfer at the University of Lodz, Technology Transfer Department at the Lodz University of Technology, Center of Innovation and Technology Transfer at the Medical University of Lodz, Arterion – Foundation for the Support of Entrepreneurship and Science, Lodz Regional Park of Science and Technology, Lodz Knowledge Transfer Platform, Technology Scouting). The Chapter also analyses university and industry collaboration in the United Kingdom, Germany, and Spain. Conclusions from their experiences for the cooperation in Lodz Region are also identified.

Chapter V – “Assessment of Barriers to Innovation Implementation in the Companies in Lodz Region and their Cooperation with Research Centres Compared
to Solutions Applied in the United Kingdom” analyses barriers to university and industry collaboration based on international literature and the specificity of such barriers in Poland, in particular in the Lodz Region, compared to barriers existing in the UK.

Against this background, we present opportunities for university and industry collaboration in the Lodz Region using British experience, i.e. concrete proposals of creating appropriate conditions for cooperation.

Chapter VI – „Recommendations for the Lodz Region in Respect of University and Industry Collaboration” concludes previous considerations. It outlines an idea of how to shape university and industry collaboration in recommendations addressed to both business and science sectors, specifying necessary measures on both sides and activities expected from local authorities, which should improve the results of cooperation.

The publication ends up with a short summary.

I wish to express our gratitude to everybody involved in the delivery of the project, especially to the representatives of our foreign partner, to the Foundation of the University of Lodz, the Implementing Authority for the Project, to the Marshal Office in Lodz for their assistance and collaboration within the project. Our acknowledgments go also to Prof. Ewa Walińska, the Dean of the Faculty of Management of the University of Lodz, who made available the offices where we could smoothly proceed with the project.

Jerzy Różański
Chapter I

University and Industry Collaboration – Studies Review

The absence of barriers to the exchange of scientific ideas and excellent conditions for cooperation between European partners in applying the results of research in real economy are priorities for many EU member states, which recognise the benefits that they bring to the society. Hence, the recurring questions on the possibility and methods of linking the world of science with other vital fields of economy, such as e.g. manufacturing, trade or finance. Besides, there is another important issue of using the effects of researchers’ work and translating their inventions and achievements into practical innovations. Modern role of a university is defined by e.g. S. Slaughter and G. Rhoades who believe that a university should engage into market-like behaviours, think in strategic terms and use marketing tools to attract students and entrepreneurs potentially interested in cooperation. Universities should also work to achieve competitive advantage, hire skilled and forward-looking staff, and „go from a public good knowledge to an academic capitalist knowledge/learning regime”\(^1\). Thus, it seems obvious, that academic science should be replaced with the type of science that responds to real needs of the market and of the economy; with science, which, as it has always been the case, provides theoretical background but, most of all, leads to practical implications.

Knowledge in business is gaining in importance and it has become the leading factor of sustainable development and growth, providing companies with lasting competitive advantage. At present, building partnership relations between businesses and R&D units has become a must. W. M. Grudzewski et al., compiled a list of reasons behind such cooperation, which includes e.g.\(^2\):

- enhanced innovation in companies,
- increased dynamism, creativity and excellence of scientific research,
- promoting exchange of information and better access to knowledge,
- improved economic efficiency,
- sharing risk and costs of R&D and innovative works.


Many authors, e.g. E. G. Mesthene and A. Pomykalski acknowledge the role of the state in identifying the strategy of science and technology development and in shaping innovation policy, stressing that they set out directions of development and create conditions for innovative performance of firms. According to K. Szopik, economic policy of the state, by creating proper conditions for innovation, knowledge transfer, and financing and creating R&D, diminishes the risk of destabilisation and contributes to quick economic growth. We must bear in mind, however, that a company’s decision to cooperate with a university depends mostly on its strategy, in particular on its openness and the possibility to use external sources, which is confirmed by works of e.g. K. Laursen and A. Salter.

1. Motivation for University and Industry Ties

There are different reasons why universities engage in cooperation with business. According to T. Bjerregaard one of the most important driving forces is more dynamic advances in science, adjusting the research to the needs of science, access to company’s data, and the ability to test new scientific solutions in practice. Cooperation helps universities shorten the time of implementation for new technologies and offers additional source of income for new research programmes, e.g. from selling licenses. Moreover, in the opinion of H. Breen and N. Hing, universities may invest additional resources in improving the quality of education or in offering new services. K. Santarek et al. additionally notice, that a university involved in cooperation with business is perceived by industrial circles as a source of practical and useful knowledge, which, in a longer perspective, enhances its attractiveness in the eyes of potential students. The latter, when acquiring knowledge, may work on case studies based on real-life problems while internships available to them, help them learn about practicalities of working in a company.

---

4 K. Szopik, Klasyfikacja uwarunkowań innowacyjności przedsiębiorstw, „Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania”, no. 1/2008, p. 33
One more important issue cannot be forgotten, i.e. the wish of academic teachers to get additional income. Studies by D. Mowery and B. N. Sampat show this motivation for collaboration with industry is especially important in engineering and medical sciences (mainly biotechnology and pharmaceutics), agriculture and related sciences as research studies in these fields are the most closely related to the market and their commercialisation is the fastest.\(^9\)

Many publications examine the reasons behind firms’ collaboration with universities. The dominating conclusion is that, in the opinion of entrepreneurs, university science does not contribute much to the development of innovative solutions. That is mainly because a university is perceived as an institution focused on academic teaching and in fact its research work is rarely known to business. According to the Main Office of Statistics (Polish abbr. GUS), in Poland knowledge on innovative solutions reaches firms via their customers, competitors, at conferences, from specialist magazines and only to a small extent from universities and Polish Academy of Sciences (Polish abbr. PAN). L. E. Weber and J. J. Duderstadt are of a similar opinion. Quoting after the surveys by M. Fritsch and Ch. Schwirten, they conclude, that closer university – industry linkages result from existing personal contacts between interested parties (39%), targeted searches for a partner (29%), and meetings at conferences or exhibitions (14%).\(^{10}\)

Expected effects of university-industry collaboration also include: higher profits for a company, higher revenue and implementation of energy-saving technologies. Access to knowledge, results of research, new solutions and research infrastructure, the possibility to hire highly qualified staff are other advantages of collaboration with universities.\(^{11}\) listed by e.g. D. C. Dan, M. Xia et al., and W. M. Cohen et. al. A company, when commissioning some tasks with a university, may expect lower costs of a research project or tax allowances.

---


2. Factors Favouring Cooperation

Literature examines relationships between geographic proximity of a university and a business and the frequency and importance of mutual ties. According to K. Laursen et al. and A. Arundel and A. Geuna geographic proximity increases the probability of universities – business interactions\(^\text{12}\). Other surveys, e.g. the analysis of German companies by M. Beise and H. Stahl, have not revealed a similar impact of cooperation with scientific institutions financed with public resources on industry innovation. Findings of many other studies are mixed and generally indicate that the proximity, however important, is secondary compared to other factors, such as scientific reputation of a R&D unit\(^\text{13}\).

P. Maskell and A. Malmberg as well as E. E. Leamer and M. Storper argue, that cultural and language similarities are important, especially when the transfer of knowledge and technology requires personal meetings\(^\text{14}\). It is confirmed by A. Arundel and A. Geuna, who add that the importance of proximity diminishes when knowledge is transferred within cooperation arrangements, which do not require direct relations, e.g. publications or patent acquisition\(^\text{15}\). Moreover, we must remember that for a company, especially a large one, the most important driver for cooperation is the reputation of research achievements in a given field, while small companies may need only consultancy or routine services usually available from universities in their immediate neighbourhood.

Having reviewed several projects that ended up with successful commercialisation of R&D works, M. Bąk and P. Kulawczuk conclude that success is more feasible when certain conditions are met. The authors claim the following activities of the academic sector contribute to the cooperation with business\(^\text{16}\):


• current analysis of trends in world R&D works and attempts to implement them in own research projects,
• promoting projects clearly aimed at the commercialisation of the effects of R&D works,
• allocating funds and resources to support entrepreneurship of own research staff,
• clear rules of rewarding the author when her/his invention is commercialised.

Another factor conducive to university and industry collaboration is the development of intermediary institutions and institutions promoting innovation and entrepreneurship. Examples of such institutions include e.g.: technology transfer centres, business incubators, parks of technology, science or industry, and training and advisory centres.

3. Types of Cooperation

Quality and effects of linkages between science and business largely depend on the preparedness of the parties and their involvement in collaboration. Knowledge transfer between universities and industry takes place in many different ways. According to P. D’Este and P. Patel they range from recruitment of university graduates to personnel exchanges, cooperative joint research, patents and publications, licensing and starting spin-off companies, laboratories, as well as informal contacts such as meetings or conferences17.

K. Santrek et al. mention many other forms of technology transfer from universities to industry, from which the most important are: opinions, expert opinions, reviews of applications or projects drafted for companies, published applications for patents and descriptions of patents owned by the university and its research staff, contract research delivered by universities to industry, targeted and contract research projects for and in cooperation with the industry, cooperative projects delivered within the framework of consortia, strategic partnership, agreements on the availability or use of the know-how and the purchase of licenses18.

Linkages between universities and business take different forms, depending on the type of a company, technological area or institution. They are particularly strong in technological areas. K. Laursen and A. Salter demonstrated that in the United Kingdom at the turn of 20th and 21st centuries the knowledge of partner universities was used the most willingly by industries such as: chemical, machinery,
and electronics, while the least active in this respect was paper industry\textsuperscript{19}. K. Kaymaz and K. Y. Eryiğit claim that certain sectors, e.g. biotechnology or pharmaceutics are „addicted” to knowledge supplied to them by universities\textsuperscript{20}, their development would not be possible without further studies.

4. Barriers to University – Industry Collaboration

Advances in university-industry collaboration constantly face various problems and obstacles, as often stressed by representatives of both parties. K. B. Matusiak states that mutual cooperation of science and business sectors is hard to organise as differences in the attitude to executed tasks are very deep and lead to a specific „communication gap”\textsuperscript{21}. It is confirmed by the studies by e.g. A. K. Klevorick et al., T. Davey et al., K. B. Matusiak and J. Guliński, and J. Machnik-Słomka\textsuperscript{22}. P. David, P. Dasgupta, D. Foray and W. E. Steinmueller maintain that the attitude to scientific research, mainly to how they are disclosed, is different for academics than for representatives of the industry. For academic researchers it is important to get recognition and be promoted, which is guaranteed by the primacy in results publication. Prompt disclosure of results and methods to achieve them is therefore the primary objective. A company placing innovations on the market strives to keep research results secret because of potential competition and the wish to “get credit” for as long as possible from being the first to apply a certain solution\textsuperscript{23}. It means, differences in expectations and mutual superstitions, sometimes reinforced by collaboration experience, are another important barrier.

On top of that, according to A. Gabryś, entrepreneurs criticise researchers for their being unfamiliar with business, they complain about not keeping the deadlines, lack of practical and concrete offers, as well as no will to change, conservatism and passive attitude vis-à-vis companies. Studies by e.g. B. Preissl clearly indicate that nowadays R&D centres, mainly universities in almost all European countries, are under pressure to meet the needs of business, which focuses on the implementation of innovation systems. Giving priority to cooperation with firms increases the risk of “identity loss” by academics. These observations, however, contradict other surveys by e.g. J. Owen-Smith and W. W. Powell. The authors demonstrate that cooperation does not collide with other common academic activities, on the contrary, it may positively impact researchers’ careers generating additional benefits, such as prestige or reputation.

5. Proposals to Improve University-Industry Collaboration

J. Adamska and L. Mytelka and F. Farinelli consider clusters one of potential sources of improvement for university-business relationships, which stimulate the development of science and innovation. Many studies by e.g. Polish Agency for Enterprise Development [Polish abbr. PARP] show that linking clusters with R&D centres is obvious as these are local innovation systems with extensive back-up that enables conducting research works and experiments and with mechanisms of information dissemination and transfer. Leading clusters must represent higher intensity of R&D works and their application, staff and knowledge transfer, and joint R&D projects. If that is additionally linked to financial support


28 Wizja klastrów i polityki klastrowej w Polsce do 2020, version 2, expert material for the discussion at 3rd meeting of the Working Group for cluster policy under the auspices of the Polish Agency for Enterprise Development „Polskie klastry i polityka klastrowa” [Polish Clusters and Cluster Policy], p. 2.
(e.g. grants) of the state, according to K. Skokan, E. Poledníková, and M. Staníčková, chances for success are big.\textsuperscript{29}

University and industry collaboration may also be encouraged by university business incubators usually initiated by academics.

Another premise for potentially increased interest in collaboration with business is encouraging universities to tighten relations with business environment institutions. Universities are willing to use them as intermediaries in quickly reaching business circles.

It seems there is no single pattern for supporting university and industry collaboration. In the opinion of A. Poszewiecki, the selection of individual elements of the system supporting the cooperation of the two communities should closely relate to „local circumstances, often culture or history - determined“\textsuperscript{30}. Based on the analysis of solutions adopted by different countries in the world, he claims an efficient cooperation system includes:

- regulatory framework supportive for university-industry collaboration,
- clear protection and control of intellectual property,
- diversified encouragement for universities and research workers, which supports commercialisation of research results,
- appropriate organisational framework for the commercialisation of research results.

When formulating the rules of efficient support to university and industry collaboration it is worth remembering the above considerations and follow the examples of countries, which for many years stress the importance of technology development, implementation of innovation and cooperation between business and R&D.


Chapter II

Innovation Performance of Firms in Lodz Region – Results of Empirical Studies

1. Innovation Performance of Firms in Lodz Region Against the Performance of the Rest of the Country

Unfortunately, innovation performance of Polish companies drops from year to year. In 2009-2011 the population of active innovative companies was shrinking. Among manufacturing companies, compared to the previous study covering the years 2008-2010, the share of active innovative companies in the total population amounted to 16.9% (against 18.1% in the previous period), while in services the share dropped from 13.5% to 12.3%.\footnote{Działalność innowacyjna przedsiębiorstw w latach 2009-2011, GUS, Warsaw 2012, pp. 21-22} Net revenues from sales of new or significantly improved products in the manufacturing sector represented 8.9%, i.e. by 2.4 pp. less than in the period 2008-2010. 11% of companies, which reported remarkable innovative success in manufacturing are large companies employing over 250 people. It means small and medium-sized enterprises still have problems with raising additional funding for innovative growth. Between 2009-2011, compared to other regions, the Region of Lodz revealed the lowest level of innovation. Last ranking position in the classification by the number of innovative manufacturing companies is the most visible. Even though the region did not rank last when it comes to organisational and marketing innovation, the results cannot be considered satisfactory as companies from Lodz Region usually occupied the lowest ranking positions.

Insufficient innovation performance in all categories clearly hindered the benefits of innovation. The share of revenue from sales of new or significantly improved products in total sales of companies from the Lodz Region was minor. However, we must stress here that the index is low across all of the country. Performance of companies from Lodz in the population of manufacturing companies was among the poorest in Poland. The index of 4.3% for revenues from sales of
innovative products in total sales is an extremely modest achievement, especially when most Polish firms were able to record much higher revenue. In 2011, manufacturing companies spent PLN 20.8 bn on innovation, i.e. by 12.4% less than in 2010.\textsuperscript{32} The Region of Lodz performed well compared to the rest of the country and it ranked 3\textsuperscript{rd} (total of PLN 2,300 mio)\textsuperscript{33}. With respect to outlays per company, the rate is the highest for the country.

2. Characteristics of Enterprises Covered by the Study

The study was conducted between May and July 2012. A group of professional interviewers processed the source material, i.e. questionnaires filled out using the „papi” (\textit{paper and pencil interview}) method, which was statistically processed using the \textit{IBM SPSS Statistics} 20 software. The study covered the group of 500 business people including 343 (68.5\%) representatives of manufacturing and 157 (31.5\%) representatives of service companies. Detailed distribution by the type of business activity is presented on Fig. 1.

![Figure 1. Economic operators included in the study by the types of activity and the size of business (in %)](image)

Source: own study.

\textsuperscript{32} Działalność innowacyjna przedsiębiorstw w latach 2009-2011… op. cit., p. 55

\textsuperscript{33} J.w., p. 57
The analysis of the source of capital in studied enterprises allows us to conclude that a clear majority (92.9%) of businesses are fully owned by Polish capital. Similarly as in the case of the so far presented characteristics, we may note that bigger companies have stronger links with foreign capital. Besides, the relationship, although rather weak ($r=0.158$), is statistically significant ($p=0.00$). Only among big companies, the share of operators fully owned by foreign capital is substantive (16.7%). Operators included in the study very rarely had mixed ownership structure.

Figure 2. Scope of activities of studied operators by the size of a company (in %).

Source: own study.

As long as the domestic scope is available to the majority of companies, independently of their size, international operations require bigger capital resources, which may become a barrier for smaller entities. This is confirmed by the results of the study. Only 41.5% of respondents are active on the European market. The majority of them are medium-sized companies, 58.7% responses, and big ones (50%). Micro-companies are represented at the European market at the share of 28.3%. The access to cross-border market is even more differentiated when it comes to global operations. Global activity was reported only by 12.8% respondents. These are, first of all, big (41.7%) and medium-sized (28%) companies. Only 9.3% of small companies operate globally.
3. Innovation Performance of Enterprises in the Lodz Region

The majority of enterprises included in the study consider innovation as important for their own development. 49% of respondents declared innovations are important and 30.4% consider them very important. The role of innovations increases with the size of the enterprise. The statement is also statistically justified as there is a link between the size of a company and the role of innovation in its development. Although the relationship is not strong ($r=0.12$), but it is statistically significant ($p=0.012$). It is worth noting, that companies consider innovation an important but not the most important factor of their development. That may translate into low innovativeness of enterprises in the Lodz Region compared to other voivodeships. Evidence is also provided by conducted studies. Less than one third of respondents had a concrete investment plan (30.7%). These were mostly big (62.5% of positive answers) and medium-sized (54.7% of positive answers) companies. Smaller operators usually did not have any formal investment plan.

Companies, which had investment plans, most frequently focused on production diversification through the launching of new products (see Table 1). Micro-companies give a lot of attention to the expansion of their businesses (56.3% of answers). Small operators invested with a view to enter new areas of activities (50.8% of answers). Medium-sized and big companies, besides production diversification, also focused on modifications to the production process (55.3% and 60% of answers respectively).

Table 1. Investment goals of enterprises included in the study (in %).\textsuperscript{34}

<table>
<thead>
<tr>
<th>Goal</th>
<th>company size</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>micro</td>
<td>small</td>
</tr>
<tr>
<td>company’s expansion – affiliates, branches</td>
<td>56.3</td>
<td>46.0</td>
</tr>
<tr>
<td>production diversification through the launching of new products</td>
<td>62.5</td>
<td>71.4</td>
</tr>
<tr>
<td>material modifications to the production process</td>
<td>31.3</td>
<td>44.4</td>
</tr>
<tr>
<td>new areas of operation</td>
<td>37.5</td>
<td>50.8</td>
</tr>
<tr>
<td>other</td>
<td>6.3</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Source: own studies.

\textsuperscript{34} Companies could select more than one answer.
The absence of a formal investment plan is one of the causes of low innovativeness of enterprises in the Lodz Region. The statement is evidenced by the distribution of answers provided by entrepreneurs to the question concerning R&D works. 89% of all operators did not conduct any R&D works. Micro- and small companies are especially little active in the field, 93.3% and 93.9% of “No” answers respectively. Own R&D works are declared by 25.3% of medium-sized operators. Big companies are the most active: 45.8% of positive answers. Thus, we may observe, that the bigger an entity, the more active it is in R&D terms. The relationship was statistically confirmed. Although it is rather weak (v=0.331), but statistically significant (p=0.00).

Poor innovation performance of enterprises in the Lodz Region makes them unable to benefit from new solutions. Over 76% of operators included in the study achieve less than 20% of their revenue from own innovations (see Table 2). Only 5.5% of respondents receive more than 50% of their revenue as a result of innovation. Against this background, we should highlight 6.7% from among micro-companies, which declared that more than 80% of their revenue comes from innovations. It is also worth stressing that companies in this group represent the highest proportion in the group of respondents (74.7%), who are the least able to benefit from innovation.

Table 2. Share of revenue received from innovations in total revenue of enterprises included in the study (in %).

<table>
<thead>
<tr>
<th>Share</th>
<th>micro</th>
<th>small</th>
<th>medium</th>
<th>large</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 20%</td>
<td>74.7</td>
<td>76.1</td>
<td>79.7</td>
<td>78.9</td>
<td>76.5</td>
</tr>
<tr>
<td>from 20% to 50%</td>
<td>16.0</td>
<td>19.1</td>
<td>18.6</td>
<td>10.5</td>
<td>17.9</td>
</tr>
<tr>
<td>from 50% to 80%</td>
<td>2.7</td>
<td>3.7</td>
<td>1.7</td>
<td>5.3</td>
<td>3.2</td>
</tr>
<tr>
<td>from 80% to 100%</td>
<td>6.7</td>
<td>1.1</td>
<td>0</td>
<td>5.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: own study.

Analysed companies most often acquired innovations based on their own resources (88.5% of total studied population). Among the group, we can distinguish medium-sized companies (92.6%). Almost half of the researched group (48%) acquire innovation by imitating the solutions applied by others. The biggest companies are the most active in the field (63.6% of responses in this group), which might be due to the fact that they have R&D support, which enables them imitating even advanced technologies, unavailable to smaller operators.

Respondents, when asked about the reasons behind innovation activities, most often declared the need to improve the competitiveness of their companies
(57.3% of answers). A little smaller group pointed to company’s development (47.5%). External factor, competitive pressure, was listed as the third most important premise of innovation (43.3% of respondents). Interestingly enough, enterprises relatively rarely stressed the need to improve their operations, such as enhanced productivity (17.3%), improved operational efficiency (16%) or reduction of operational costs (18.8%). In this group of premises for innovation we can see that responses selected by big companies clearly prevail. Smaller operators perceived mostly the issue of the competitive pressure and the need to increase their profits.

Innovation operations by enterprises in the Lodz Region are financed mostly from their own resources, in particular from undistributed profits (58.4%). Shareholders’ capital contributions rank second in respect of the importance of the source of funding, although we need to note that enterprises included in the study used bank loans to the similar extent. Leasing and funding using the EU resources should be regarded auxiliary sources of capital (17% and 18.3%). The proportion of declared collaboration with venture capital funds or business angels, i.e. institutions the best placed to finance innovation activities, (1%) is obviously unsatisfactory.

Table 3. Barriers to innovation in enterprises included in the study (in %).

<table>
<thead>
<tr>
<th>Barrier</th>
<th>micro</th>
<th>small</th>
<th>medium</th>
<th>large</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High costs of developing and implementing innovations</td>
<td>84.8</td>
<td>81.8</td>
<td>79.7</td>
<td>77.3</td>
<td>82.0</td>
</tr>
<tr>
<td>Absence of adequately skilled personnel</td>
<td>23.8</td>
<td>30.4</td>
<td>32.8</td>
<td>45.5</td>
<td>29.9</td>
</tr>
<tr>
<td>Insufficient technical base</td>
<td>27.6</td>
<td>29.1</td>
<td>35.9</td>
<td>27.3</td>
<td>29.7</td>
</tr>
<tr>
<td>Lack of information on new technologies</td>
<td>21.9</td>
<td>17.0</td>
<td>12.5</td>
<td>13.6</td>
<td>17.4</td>
</tr>
<tr>
<td>Lack of information on the market (customers’ needs, sales opportunities)</td>
<td>7.6</td>
<td>7.3</td>
<td>12.5</td>
<td>4.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Difficult access to experts and advisors</td>
<td>21.9</td>
<td>27.1</td>
<td>23.4</td>
<td>36.4</td>
<td>25.8</td>
</tr>
<tr>
<td>Lack of sectoral contacts (e.g. with potential collaborators)</td>
<td>7.6</td>
<td>16.2</td>
<td>17.2</td>
<td>13.6</td>
<td>14.2</td>
</tr>
<tr>
<td>Other</td>
<td>1.0</td>
<td>3.2</td>
<td>1.6</td>
<td>0.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Source: own study.
Poor innovation performance of the enterprises in the Lodz Region is the most frequently explained by high costs of developing and implementing innovations (see Table 3). As many as 82% of respondents decided it was the biggest obstacle. We can also clearly notice, that the barrier concerns mainly operators, who do not have sufficient capital. The smaller a company, the higher rate of answers stressing too high cost of innovation activities. Other obstacles to innovation are: absence of adequately skilled personnel, insufficient technical base and difficult access to experts from outside of the company. Problems with the staff concern mainly big enterprises, they are the least in the group of micro-companies, which may be due to the scope of conducted works.

4. Conclusions

The lack of capital is the main reason of poor innovativeness in the Lodz Region. In order to minimise financial risk, enterprises strive to cover innovation-related investment outlays with their own capital. Unfortunately, in most cases the capital is insufficient and entrepreneurs must complement it with a bank loan. Large portion of enterprises in the Lodz Region have too poor creditworthiness and financial stability to apply for a loan. Moreover, banks, when processing loan applications, disregard innovative specificity of economic activity, especially for SMEs. For commercial banks they are a group of high risk customers with volatile cash flows that may provoke difficulties in timely repayment of liabilities. In the Lodz Region the majority of enterprises fall into the group of micro-, small and medium-sized enterprises. For natural reasons, these operators need more financial support.

To improve innovation in the Lodz Region we need to support the development of enterprises by reinforcing their collaboration within clusters and encouraging them to deepen cooperation between enterprises and research units. It is also important to improve the awareness of entrepreneurs with respect to available alternative sources of funding innovation. Assistance of the officials from the Lodz Voivodeship could be a valuable suggestion. After the period covered with strategic activities under the LORIS 2030 Programme, Lodz Voivodeship stands good chances of improving innovation performance of manufacturing enterprises.
Chapter III

University-Industry Collaboration in the Lodz Region – Results of Studies

1. Cooperation with External Research Units

University and industry collaboration leading to the implementation of innovative solutions, the main indicator of knowledge-based economy, is gaining in importance\textsuperscript{35}. The cooperation should take place on a regular basis. Its continuation over a longer period of time enables the follow-up of mutually undertaken projects, analysing and correcting them. That opens up an area for monitoring the so-far effects of cooperation\textsuperscript{36}.

The study indicates that big enterprises, with a large proportion of foreign capital and enterprises, which operate at international scale are much more inclined to transpose state-of-the-art solutions elaborated together with scientific units into their activities. Results also demonstrate that manufacturing companies are more experienced in the area than the service ones. The above characteristics are clearly closely linked. Indeed, big enterprises, which often pursue complex production processes, spend much more on new technologies and are relatively more frequently active internationally, where innovation of offered products and services guarantees strong competitive advantage.

With respect of the type of cooperation, interviewed enterprises most often mentioned:

- commissioning research for the company to universities/R&D units – 34.5\% of all answers,
- consulting received from universities/R&D units – 28.2\% of total answers,
- joint R&D projects – 27.3\% of total answers.

When it comes to the frequency of relations, businesses cooperate the most often with universities (86\% of answers by respondents who implement joint projects with research units), followed by R&D units – (49.4\% of answers) and industrial research institutes (36.4\% of answers). Technology transfer centres and industrial parks turned out to be the least important (respectively 3.2\% and 4.4 \% of


\textsuperscript{36} Jemielniak D., Koźmiński A., Zarządzanie wiedzą, Wolters Kluwert, Warsaw 2011, p.165
answers). The Lodz Region is a vigorous university centre with a big pool of research staff, which may influence the choice of universities as leading partners in cooperation.

Depending on the sector, in which interviewed companies operate, different frequency of a specific type of cooperation was reported (Table 1).

Table 1. Types of cooperation between companies and research units (answers do not sum up to 100% as respondents could select more than one answer)

<table>
<thead>
<tr>
<th>No.</th>
<th>Types of cooperation</th>
<th>Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>manufacturing</td>
</tr>
<tr>
<td>1</td>
<td>Commissioning research for the company to universities/R&amp;D units</td>
<td>37.00%</td>
</tr>
<tr>
<td>2</td>
<td>Consulting received from universities and R&amp;D units</td>
<td>28.40%</td>
</tr>
<tr>
<td>3</td>
<td>Joint R&amp;D projects</td>
<td>30.90%</td>
</tr>
<tr>
<td>4</td>
<td>Commissioning a prototype model, a trial product release</td>
<td>29.60%</td>
</tr>
<tr>
<td>5</td>
<td>Joint undertakings (companies/ R&amp;D units/ technology transfer arrangements)</td>
<td>21.00%</td>
</tr>
<tr>
<td>6</td>
<td>Training for company’s staff</td>
<td>16.00%</td>
</tr>
<tr>
<td>7</td>
<td>Use of academic laboratories</td>
<td>23.50%</td>
</tr>
<tr>
<td>8</td>
<td>Involvement of company’s staff in university teaching</td>
<td>4.90%</td>
</tr>
<tr>
<td>9</td>
<td>Use of company’s infrastructure by universities</td>
<td>11.10%</td>
</tr>
<tr>
<td>10</td>
<td>License agreement</td>
<td>4.90%</td>
</tr>
<tr>
<td>11</td>
<td>Company located in university scientific parks</td>
<td>4.90%</td>
</tr>
<tr>
<td>12</td>
<td>Cooperation within a spin-off arrangement</td>
<td>1.20%</td>
</tr>
<tr>
<td>13</td>
<td>Other</td>
<td>2.50%</td>
</tr>
</tbody>
</table>

Source: own calculations based on the results of a questionnaire survey

For service companies high proportion by the type of cooperation was reported for training the staff of service companies by research workers (37.9% of answers), the involvement of the staff from service companies in university teaching
(27.6% of answers), commissioning research for the company to universities/R&D units (27.6% of answers), and consulting received from universities/R&D units (27.6% of answers). For manufacturing companies the dominant type of cooperation is the commissioning of research for the company to universities/R&D units (37% of answers), joint R&D projects (30.9% of answers), commissioning a prototype model, a trial product release (29.60% of answers), consulting services (28.40%), and the use of university laboratories by the company (23.50% of answers).

Independently of the previous experiences in delivering joint undertakings with the research sector and of the type of company’s activity, respondents stressed the following most important benefits of university-industry collaboration:

- possibility to implement innovative solutions (51.0% of total answers by companies); the benefit is more clearly perceived by manufacturing than by service companies (55.0% and 43.7% of answers respectively), but also by companies involved in cooperation (60.6% of answers compared to 40.8% of answers by non-cooperating companies),
- access to the latest specialist knowledge (45.0% of total answers by companies), with higher proportion of answers by service companies (54.9%) and by companies already involved in cooperation (53.8%),
- improved competitiveness (45.0% of total answers by companies).

Enhanced business reputation was less frequently selected as a potential outcome of collaboration with universities (20.8% of total answers by companies), similarly to benefits connected with winning new customers and/or markets (24.3% of total answers by companies), and the opportunity to develop company’s human resources (20.8% of total answers by companies). It demonstrates that responding companies are not satisfied with the cooperation with science sector with respect to market expansion, or, more precisely, with respect to benefiting from an increased market share on their specialist markets. In most cases, satisfaction from cooperation is assessed better by manufacturing companies. However, it is positive that companies perceive research units as an important source of specialist knowledge, knowledge on the latest technologies, perhaps that is due to their relatively frequent contacts with universities.

Interestingly, companies which had no previous experience of cooperation with research units, when listing benefits more often stressed the possibility to reduce costs by increasing productivity than companies with a track record of such cooperation (34.7% of answers for non-cooperating companies compared to 25.0% of answers by companies involved in cooperation), possibility to win new customers and/or markets (26.5% compared to 22.1% of answers). It may suggest that some
expectations vis-a-vis research units and the effects of cooperation exceed actual outcomes.

2. Barriers to cooperation and directions of their elimination

In the opinion of vast majority of respondents (almost 75% of answers), the offer of research units mismatches the needs of the companies in the Lodz Region.

Table 2 lists factors suggested by entrepreneurs as reasons for the mismatch between what R&D units offer and what companies need.

Table 2. Reasons for the mismatch between the offer of research units and companies’ needs (answers do not sum up to 100% as respondents could select more than one answer)

<table>
<thead>
<tr>
<th>No.</th>
<th>Reason</th>
<th>Company manufacturing</th>
<th>Company service</th>
<th>Company total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The offer is unknown</td>
<td>64.30%</td>
<td>64.90%</td>
<td>64.50%</td>
</tr>
<tr>
<td>2</td>
<td>The offer does not consider the specificity of an industry</td>
<td>44.50%</td>
<td>45.40%</td>
<td>44.80%</td>
</tr>
<tr>
<td>3</td>
<td>Proposed solutions are too expensive</td>
<td>30.80%</td>
<td>22.70%</td>
<td>28.00%</td>
</tr>
<tr>
<td>4</td>
<td>The offer is not detailed enough</td>
<td>14.80%</td>
<td>10.30%</td>
<td>13.30%</td>
</tr>
<tr>
<td>5</td>
<td>Implementation of solutions proposed in offer is too much time-consuming</td>
<td>11.00%</td>
<td>17.50%</td>
<td>13.30%</td>
</tr>
<tr>
<td>6</td>
<td>Proposed solutions are not innovative enough for the company</td>
<td>7.10%</td>
<td>16.50%</td>
<td>10.40%</td>
</tr>
<tr>
<td>7</td>
<td>Other</td>
<td>2.20%</td>
<td>1.00%</td>
<td>1.80%</td>
</tr>
</tbody>
</table>

Source: own calculations based on the results of a questionnaire survey

Remarkably, over a half of respondents admitted that the reason why the offer of the science sector mismatches companies’ needs is insufficient knowledge of the offer, 64.5 % of total answers. It leads us to the conclusion that the availability of the offer of research units is relatively poor, which makes an important contribution into recommendations. Information channels are either too diluted or they go in just one direction. Lack of feedback indicates that promotion-related activities, based on two-direction relations for reasons of efficiency, work poorly and one-way only.

Further the respondents stressed that:
- the offer of R&D units does not consider the specificity of their industries – 44.8% of total answers,
solutions proposed by R&D units are too expensive for potential customers – 28.0% of negative answers by all respondents, and that is experienced more by manufacturing than service companies (33.8% of answers by manufacturing companies and 22.7% of answers by service companies).

We may note that the fact that cooperation is time-consuming does not affect respondents answers too much (13.3% of total answers), similarly to too low innovation intensity of proposed solutions (only 10.4% of total answers). However, it seems that these barriers hinder service companies much more.

3. Future Plans for University and Industry Collaboration in the Lodz Region

When it comes to the type of planned cooperation (Table 3), respondents pointed most often to:

- Training company’s staff – 45.6% of total answers by companies,
- Consulting – 33.5% of total answers,
- Joint technology development – 29.1% of total answers,
- Joint R&D projects – 27.2% of total answers.

Table 3. Types of planned cooperation between companies and research units (answers do not sum up to 100% as respondents could select more than one answer)

<table>
<thead>
<tr>
<th>o.</th>
<th>Type of planned cooperation</th>
<th>Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>manufacturing</td>
</tr>
<tr>
<td>1</td>
<td>Training company’s staff</td>
<td>29.4%</td>
</tr>
<tr>
<td>2</td>
<td>Consulting delivered by university/ R&amp;D unit</td>
<td>30.4%</td>
</tr>
<tr>
<td>3</td>
<td>Joint technology development</td>
<td>37.3%</td>
</tr>
<tr>
<td>4</td>
<td>Joint R&amp;D projects</td>
<td>34.3%</td>
</tr>
<tr>
<td>5</td>
<td>Commissioning research for the company to university/ R&amp;D unit</td>
<td>27.5%</td>
</tr>
<tr>
<td>6</td>
<td>Involvement in joint undertakings (companies/ R&amp;D units/ technology transfer units)</td>
<td>20.6%</td>
</tr>
<tr>
<td>7</td>
<td>Commissioning the production of a prototype model</td>
<td>23.5%</td>
</tr>
<tr>
<td>8</td>
<td>Use of university laboratories</td>
<td>23.5%</td>
</tr>
</tbody>
</table>
We should note that types of cooperation between partners are dominated by training and consulting initiatives. The main reason behind these answers is most probably the financial barrier on the part of respondents combined with often highlighted inefficiency of promotion channels and inadequately operating two-way flow of information (between research units and companies). Attention must be paid, however, to the diversified, industry-specific structure of answers. Among service companies as many as 75.0% of respondents declared the wish to be involved in training for companies delivered by the science sector. This type of cooperation dominated previous contacts of service companies with science. Entrepreneurs from the service sector also selected consulting offered by the world of science to companies, and the involvement of their staff into university teaching as planned types of cooperation (respectively 39.3% and 26.8% of answers by service companies). Manufacturing companies, probably due to the specificity of their operations, plan to cooperate with science in joint technology development (37.3% of total answers by manufacturing companies), joint R&D projects (34.3% of total answers by manufacturing companies), and consulting delivered by the science sector (30.4% of total answers by manufacturing companies).

When it comes to units, with which businesses plan to cooperate (Table 4), independently of the sector, the most prominent role is played by:

- universities – 78.7% of total answers, where service companies selected universities more often than manufacturing companies, probably due to the nature of planned cooperation (e.g. involvement in university teaching),
- R&D units – 59.4% of total answers with manufacturing companies selecting the option more frequently than service ones,
• industrial research institutes – 33.5% of total answers; in this case manufacturing companies prevail.

Table 4. Research units with which researched companies plan to cooperate (answers do not sum up to 100% as respondents could select more than one answer)

<table>
<thead>
<tr>
<th>o.</th>
<th>Research units</th>
<th>Companies</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>manufacturi ng</td>
<td>service</td>
<td>total</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Universities</td>
<td>75.5%</td>
<td>84.9%</td>
<td>78.7%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R&amp;D units</td>
<td>63.7%</td>
<td>50.9%</td>
<td>59.4%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Industrial research units</td>
<td>39.2%</td>
<td>22.6%</td>
<td>33.5%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Technology parks</td>
<td>15.7%</td>
<td>11.3%</td>
<td>14.2%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Technology transfer centres</td>
<td>8.8%</td>
<td>18.9%</td>
<td>12.3%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Research foundations</td>
<td>5.9%</td>
<td>17.0%</td>
<td>9.7%</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Industrial parks</td>
<td>9.8%</td>
<td>9.4%</td>
<td>9.7%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Other</td>
<td>2.9%</td>
<td>0.0%</td>
<td>1.9%</td>
<td></td>
</tr>
</tbody>
</table>

Source: own calculations based on the results of a questionnaire survey

Taking account of the sector, in which interviewed companies operate, we should note that the selection of preferred research units is sector-specific. That is most probably due to the nature of envisaged cooperation:

• service companies, where cooperation focuses on training and involvement in university teaching, give much bigger preference to universities than manufacturing companies,

• manufacturing companies, due to the nature of cooperation, much more focused on technology than the service companies, selected R&D units and industrial research institutes.

Nevertheless, it could be worthwhile to try and expand the relationships between manufacturing companies and universities. The involvement of practitioners in teaching could become a valuable source of practical knowledge and give proper direction to research conducted by the university.

Besides, research units from the science sector, also technology transfer centres, and research foundations are important cooperation partners to service companies and technology parks for manufacturing companies.
Chapter IV

Assessment of the Existing Information Exchange System between Science and Business Sectors in the Lodz Region against Solutions Applied in the United Kingdom and Other European Countries

1. University and Industry Collaboration: Knowledge and Technology Transfer in the Lodz Region

1.1. Scientific and Research Potential in the Lodz Region

The Region of Lodz ranks respectively sixth and seventh in Poland with respect to the number of R&D units and the number of researchers employed in these units. In 2011 in the Lodz Region there were 131 R&D units. The biggest population was that of development-oriented units, i.e. economic operators, which, besides their core activity, pursue R&D operations (usually enterprises with their own R&D departments) or scientific and research centres.

The Lodz Region is a big academic centre with strong R&D potential. The potential, however, is not fully utilised, which is evidenced by the structure of R&D expenditure by types of research in the region, where basic research, often with no continuation in applied research and development works, dominate. It may be due to little intensity of university and industry collaboration and hence it seems necessary to put in place university-industry collaboration mechanisms, e.g. under the existing Regional Innovation System (RIS), which could help better use the scientific and research potential of the Lodz Region.
1.2. Current Solutions in University and Industry Collaboration in the Lodz Region – Selected Examples

1.2.1. Innovation Centre – Technology Accelerator of the Foundation of the University of Lodz

The Centre was established in 2003 as a result of cooperation between the University of Lodz and University of Texas. Its main services include:

- assistance in finding an appropriate partner at the University of Lodz,
- organisational as well as legal and formal assistance to the partner in developing rules of cooperation with the University,
- assistance in getting funding for innovation implementation from seed funds and business angels,
- market analyses and analyses of technology/innovation designed to evaluate the innovation and market potential of a project at the R&D stage or in the stage of preparation to implementation,
- training courses in innovation and technology commercialisation, especially in the area of the protection of intellectual property.

1.2.2. Incubator of the University of Lodz

Incubator of the University of Lodz offers business, organisational and technological advice to operators at an early stage of business development or start-ups. Incubator does not offer its services to enterprises only but also supports innovation or research projects, which have business potential.

1.2.3. Centre for Technology Transfer at the University of Lodz

Centre for Technology Transfer (CTT) at the University of Lodz commercialises results of research conducted by University of Lodz researchers but also by researchers from other universities and institutes, and entrepreneurs own results of research, which they want to implement and cooperate with the Regional

---

37 Drafted based on the content available at the website of Innovation Centre – Technology Accelerator of the University of Lodz, http://www.ciat.uni.lodz.pl/ (access on 01.07.2013) and the interview with E. Postolska published by A. Rogut, M. Cieślak, Portret regionalnych instytucji..., op. cit., p. 238.

38 Drafted based on the content available at the website of the Centre for Technology Transfer at the University of Lodz http://www.ctt.uni.lodz.pl/ (access on 01.07.2013) and the publication by A. Rogut, M. Cieślak, Portret regionalnych instytucji..., op. cit., p. 237.
Patent Centre of the University of Lodz. The objective of the Centre for Technology Transfer at the University of Lodz is to coordinate activities in the field of innovative ideas in academic and business circles and in public domain, in particular:

- commercialisation of knowledge and technology,
- knowledge and technology transfer through the University Incubator of Technology.

1.2.4. Technology Transfer Department at the Lodz University of Technology

Technology Transfer Department (TTD) at the Lodz University of Technology was established in 2008 with the main objective to support initiatives of the University of Technology in the area of promoting and implementing results of research works.

The most important tasks of the Technology Transfer Department include:

- collecting data on the on-going research works
- identification of research for commercialisation,
- promoting new and original technological solutions developed by research teams by presenting their results in catalogues and databases,
- developing the rules of technology transfer from the university to industry,
- identifying companies or institutions interested in cooperation with the university,
- facilitating the collaboration of potential partners,
- assisting university staff on starting their own businesses (spin-off and start-up programmes),
- support in raising external funding.

---

1.2.5. Centre of Innovation and Technology Transfer at the Medical University of Lodz

The Centre was established in 2010 within the project Innovation and Entrepreneurship Animator in the Medical University of Lodz — ANIMA. The idea was to get academics closer to business by promoting innovative undertakings and entrepreneurship.

Services of the Centre include promoting the intellectual potential of universities and assistance in establishing cooperation between universities and industry, consulting in managing intellectual property and support in raising funding for innovative projects.

1.2.6. Arterion — Foundation for the Support to Entrepreneurship and Science

Arterion. Foundation for the Support to Entrepreneurship and Science was initiated by the City of Lodz Office, Academy of Humanities and Economics in Lodz and the Polish Federation of Engineering Associations NOT with creative industries in mind. Arterion runs an Incubator of Technology in Lodz, which supports the development of existing companies and the creation of start-ups.

Arterion aims at assisting companies with valuable ideas in their commercialisation. The Foundation addresses its offer mainly to operators without appropriate material and financial background, little experienced in running a business.

1.2.7. Lodz Regional Park of Science and Technology — TechnoPark

TechnoPark is a project of the City of Lodz, the Voivodeship of Lodz, University of Lodz, Lodz University of Technology, Medical University of Lodz, Lodz Wholesale Market „Zjazdowa” SA, and Lodz Chamber of Commerce and Industry. Its mission consists in transferring modern technologies from universities to business through a technology incubator.

40 Drafted based on the content available on the website of the Centre of Innovation and Technology Transfer at the Medical University of Lodz, http://umed.pl/ciitt/ (access on 01.07.2013).
42 Drafted based on the content available on the website of Lodz Regional Park of Science and Technology, www.technopark.lodz.pl (as at 01.12.2011).
1.2.8. Lodz Knowledge Transfer Platform

Lodz Knowledge Transfer Platform (LKTP) is a project initiated by the Department of Entrepreneurship of the Marshal Office of the Lodz Voivodeship back in 2009. Its main objective is to facilitate knowledge transfer from science to business sector. The Platform can, on the one hand, create databases with offers from research units and, on the other hand, a database of companies’ needs. The Platform is addressed to:

- entrepreneurs seeking to implement new solutions in companies,
- universities, R&D units offering interesting solutions, ready for implementing,
- students, Ph. D. students seeking inspiration for their diploma works, M.A., Ph.D. dissertations and internships.

1.2.9. Technology Scouting

SCOUTING — an active system of monitoring and market potential valuation as the key to university-industry collaboration is a project of the Faculty of Management of the University of Lodz within sub-measure 8.2.1 of the Operational Programme Human Capital delivered in cooperation with the University of Cadiz (Spain) and Politecnico di Torino (Italy). The main objective of scouting at universities is to improve their abilities to collaborate with business people.

The objectives are delivered using the so called university model of knowledge and technology scouting composed of two complementary elements: a systemic pillar (how to set up and run a team of scouts within the system of knowledge commercialisation and technology transfer at a university) and educational pillar (substantive and practical training of scouts in the course of postgraduate studies combined with some months of working as a scout at the University of Lodz) developed by two expert teams under the project.


2.1. United Kingdom

United Kingdom has got a strong scientific base and is highly innovative country, in particular in the service sector. R&D activities are pursued mostly by companies and universities.
Examples of university – industry collaboration in the United Kingdom include:

- **Corridor Manchester** — partnership between Central Manchester University Hospitals NHS Foundation Trust, Manchester City Council, University of Manchester (UoM), and Manchester Metropolitan University (MMU). Corridor joins universities, research centres at hospitals, as well as culture institutions, such as museums, art. galleries, cinemas and theatres. It is an important cluster of knowledge-based organisations.

- **Manchester Science Park (MSP)** launched in 1984 as a result of collaboration with the University of Manchester, Manchester City Council and the private sector. It offers quality accommodation for knowledge-based, innovative companies. There are ca. 90 firms based in the Park representing knowledge-based sectors, from digital media and websites developing up to clinical tests and biotechnology. Salford Innovation Park is a part of the Manchester Science Park, with almost 150 SMEs active in digital media, culture and other industries. There is also Central Park offering services to Hi-Tech start-ups.

- **Daresbury** — is a science and innovation campus where Daresbury Laboratory, world class scientific research centre, is based. In 2005 government policy to support research commercialisation and knowledge transfer led to the construction of the Cockcroft Institute and the Daresbury Innovation Centre. The Daresbury Innovation Centre hosts almost 100 knowledge-based and new technology companies.

- **Airport City, Manchester Airport** is the largest airport (excluding the South East region) in England and the biggest engine for economic growth of the region. Its strong links with Manchester scientific base, especially with the Manchester Metropolitan University’s Centre for Air Transport, the airport has got the potential to impact innovative growth of the region.

### 2.2. Spain

An example of good practice in building up university and industry collaboration is regional R&D&I policy conducted in Balearic Islands, oriented at smart specialisation. In theory, smart specialisation means building regional development on innovations originating from competitive advantages, which importantly distinguish the region in question from others. In practice regional

---

43 *Ibidem*, p. 46–47.
R&D&I policy for Balearic Islands consists in seeking domestic and international alliances to find scientific and technological support for the region, to identify investment directions in science and innovation, and to modify the system of R&D works (with tourism and related industries as priorities). In order to deliver the policy, they established a Plan for Science, Technology and Innovation at Balearic Islands based on the following assumptions:\(^{45}\):

- talent management — to increase the number of researchers working in R&D units and in industry,
- research — higher outlays on R&D and strengthening key research competence,
- innovation — infrastructure development for companies, subsidies for SMEs, innovation promotion,
- knowledge transfer — mandatory university–industry collaboration in basic research,
- knowledge and capital — *good governance*.

### 2.3. Germany

Technology scouting of the Deutsche Telecom (DT) is an example of good practice in university-industry collaboration. The system known as the Technology Radar uses a network of scouts who collect data on technologies that could be used by DT. Technology scouting is for\(^ {46}\):

- early identification of technologies and technological trends,
- improving the awareness concerning opportunities and threats of technology development,
- innovation stimulation by linking knowledge on emerging technologies and their potential business use,
- facilitation of technology acquisition from external world, directly through scouts, using their sources of information.

---


\(^{46}\) M. Nowak, Rola pośrednictwa innowacyjnego…, op. cit., p. 146.
3. Assessment of the Existing System of University and Industry Collaboration in the Lodz Region

R&D in the Lodz Region are conducted mainly by universities, R&D centres and enterprises with adequate infrastructure. R&D consist in applying existing knowledge, acquired from basic and applied research, to develop new or improved machinery, products, processes, etc. Companies use proven solutions in innovation implementation as they buy technologies, machinery and equipment. Such operations are limited to traditional transfer solutions and do not contribute to university and industry collaboration.

R&D potential of the Lodz Region is substantial as there are many R&D centres, universities and researchers. There are also many organisations set up to establish two-way cooperation between business and science. In the Lodz region there are two technology parks, two technology incubators at these parks, four pre-incubators and university business incubators, four business incubators, five technology transfer centres, twenty training and advisory centres, and two technology platforms (for construction and textile industry). Despite such infrastructure, knowledge transfer is limited to industry meetings, workshops and training courses organised by these institutions to explain principles of cooperation and knowledge commercialisation. Such meetings are theoretical and provide the first stage for building relationships between science and business. The difficulty consists in proceeding to the next stage, i.e. practical commercialisation of technologies developed in research.

University and industry collaboration in the Lodz Region is neither based on strategic foundations nor oriented at long-term innovation development. It focuses on improving existing products or technologies already commercialised. Existing innovation support infrastructure is immature in the region. The reason could be the absence of appropriate communication between the two worlds, that could ensure exchange of information about the potential and needs of science and business communities.

Selected organisations are discussed in the first part of the Chapter.
Chapter V

Assessment of Barriers to Innovation Implementation in the Companies in Lodz Region and their Cooperation with Research Centres Compared to Solutions Applied in the United Kingdom

Any form of cooperation, including university and industry collaboration, independently of country and time, faces numerous difficulties that hamper its smooth course of action. Apparently, the longer the tradition of joint projects between universities and business (as e.g. in the UK), the fewer barriers they face. It turns out, however, that the countries of Western Europe, when it comes to university and industry collaboration, are often confronted with obstacles typical also to Polish reality.

The Chapter is divided into five parts. The first one reviews the literature on barriers to university – business relationships. Further three discuss the difficulties connected with university and industry collaboration in Poland, in the Lodz Region and in the UK. The final one outlines opportunities and potential for cooperation between companies from the Lodz Region and research units and presents possible adaptation of some British solutions.

1. Theoretical Background for Barriers to University and Industry Collaboration

In Europe and in the United States first examples of cooperation between universities and business were recorded already in mid-18th century in the times of industrial revolution. In subsequent decades they got more and more formalised. In the second half of 20th century, however, increasing difficulties in maintaining a balanced budget made many governments turned to academic centres requesting them to start seeking other sources of receiving financial resources. That, to a large extent, tightened the relations between universities and industry and, with the passing of time, it turned out that private capital successfully filled in the gap.48

Knowledge can be transferred to the general public mostly through education and scientific publications (the so called public knowledge). Unfortunately, often the

situation is that private sector entities for various reasons may not benefit from public knowledge and are forced to pursue R&D activities themselves (they develop the so called private knowledge) and to place innovative solutions on the market themselves. As universities are increasingly pressed to commercialise their research, the possibility for cooperation opens up. However, it appears that the cooperation does not develop smoothly and both sides often face numerous problems that negatively impact their mutual relations.

The reason why barriers arise lies in different „incentive system”, on which the operations of individual entities are based. The main motivation for academic centres is the creation and dissemination of new knowledge, while the main incentive for companies is the wish to use the knowledge to increase their competitive advantage over other companies. Research units, however, may not fully participate in the division of income from the commercialisation of their own solutions and hence they are trying to reserve the majority of intellectual property rights to themselves, which is not a favourable solution for business. 49

Another conflict results from different approach to making public the effects of conducted research. Scientists want to make the knowledge public as quickly as possible while companies want to keep it secret for as long as possible. 50

Studies show that barriers arising during university – industry collaboration can be diminished in three ways: (1) by prior experience in collaboration; (2) thanks to differentiated cooperation channels, also informal; (3) by trust between both parties. 51

2. Existing Barriers to University – Industry Collaboration in Poland

Surprisingly, in Poland one of the crucial problems, which prevents closer science – industry collaboration, is the lack of interest in such collaboration. 1/5 of all companies are unaware of the possibility to cooperate with universities, 40% out of them never even tried to start it, and 58% do not see the need to collaborate with universities. 52

Another barrier, which hinders closer collaboration between universities and businesses in Poland is the lack of entrepreneurs’ trust in Polish universities and low assessment of their teaching performance. According to general opinion, universities

50 Ibidem, p. 859
51 Ibidem, p. 860
52 Bariery współpracy przedsiębiorców i ośrodków naukowych, Ministry of Science and Higher Education, Warsaw, 2006
are outdated, unable to adjust to changing requirements of contemporary market and the teaching content does not fit the reality of modern economy. Entrepreneurs also draw attention to little experience of Polish academics in collaboration with business. Moreover, academic staff focus mostly on basic research, at the cost of applied research, which is the most valuable from the viewpoint of entrepreneurs. On top of that, according to business people, academics represent different approach to the ethos of work, and the difference consists in the style of working and working time organisation. Both parties stress the misunderstanding of the idea of collaboration and mistaken view on its essence, where academic circles often mix it with sponsorship\(^{53}\).

Studies of barriers to university-industry collaboration also show that companies are afraid of being accused of favouring a certain university, which may also be a barrier. University authorities, in turn, want to avoid the accusations of promoting technological solutions of a given company and explaining why this not that company is their partner in collaboration\(^{54}\). It is connected with a phenomenon frequently present at Polish universities, which is sometimes referred to as the so called „academic illegal economy”, which consists in conducting research commissioned by companies using the equipment and infrastructure of the academic centre, where the researchers are employed.

Neither are contacts between academic centres and businesses supported by legal regulations relating to science and technology in Poland, which in vast majority remained unchanged since the 1970s and 1980s. To make things worse, some legal acts on higher education are contradictory\(^{55}\). One more barrier is created by excess red tape and stringent fiscal rules in Polish research units. Numerous formalities slow down the establishing of cooperation and discourage both sides to collaborate. Besides, many researchers realise that a large portion of the income generated by them will be allocated, through high taxes, to the external world.

Another barrier is the absence of financial resources earmarked for cooperation in companies’ budgets. Entrepreneurs suggest the introduction of new allowances and tax concessions. According to them, the existing technological allowance for the purchase of new technologies or soft loans are not enough to initiate efficient collaboration.

Having reviewed the barriers, which hinder efficient collaboration between universities and industry in Poland, we shall proceed to analyse regional cooperation.

---


\(^{54}\) *Ibidem*, p. 19

\(^{55}\) *Ibidem*, pp. 36-37
3. University and Industry Collaboration in the Lodz Region

Undoubtedly, barriers, which hamper university-industry collaboration in the Lodz Region are largely identical with obstacles reported for other regions. We will discuss them based on the report „Współpraca nauki i biznesu na przykładzie regionu łódzkiego” [University and industry collaboration in the Lodz Region] drafted in mid-2012 within the Project „University and Industry Collaboration as a Factor Reinforcing Innovation in the Lodz Region”.

The study demonstrated that, contrary to the results of studies covering all of Poland, in the Lodz Region the majority of companies (ca. 3/4 enterprises) cooperate with academic centres. Some firms, however, responded they were not fully aware what research was conducted at universities and that often translates into the lack of companies’ interest in cooperation as they do not know what the cooperation could do for them. Entrepreneurs know there are Internet platforms designed to help establish relations between both sides, however, respondents claim they are little transparent and for that reason they may not deliver objectives, for which they were set up. There is also a problem of mismatch between the offer of research units addressed to business and the expectations of the latter. Business people firmly stress that collaboration should not be a pro forma cooperation only for marketing purposes.

It appears that in the Lodz Region cooperation is initiated based on informal contacts of entrepreneurs and researchers. Many representatives of business highlight they do not know whom they should contact when they want to develop a more formal relationships. Even worse, entrepreneurs, wishing to initiate relations with academics often encountered passive reactions of universities, which made an impression of a complete lack of interest in establishing any relationship.

Some entrepreneurs underline that projects delivered in collaboration with universities imply excess costs, which is especially a problem for small companies, which do not have sufficient resources to finance such undertakings. They suggest, Polish authorities should focus on introducing new, mainly tax, incentives and solve the problem of permanent underfunding of universities.

Besides the financial barrier, entrepreneurs also point to legal issues connected with joint research. In terms of law, grants received by universities may not be used for commercial purposes and there is a problem of interpreting cases, where, e.g. inventions were successfully commercialised and bring income. Moreover, there are substantial restrictions on expenditure within a project; they are strictly specified and often eliminate flexibility. Another obstacle is the deadline

56 In the Lodz Region it is the Lodz Platform of Knowledge Transfer.
within which a research study is to be completed. For researchers grants are long-term projects, with time horizon ranging from a year to several years.

According to entrepreneurs, research staff have a different attitude to work organisation. Too many obligations, which researchers must perform for their research centres often delay projects. They also claim research staff focus mostly on basic research and are not interested in commercialisation of their research.

On top of that, local authorities should engage more in building links between science and business sectors by providing organisational and financial support. Entrepreneurs believe, local authorities should become a linking element between research centres and businesses, support implemented projects, and exert pressure on both sides to deliver measurable outcomes of such cooperation, e.g. patent applications.

4. Barriers to University and Industry Collaboration in the United Kingdom

Although the British model of university-industry collaboration may be a model for Poland, studies conducted in the United Kingdom reveal it is not free of problems, which disturb smooth course of collaboration. They show that, to a large extent, the cooperation faces difficulties similar to those experienced by academics and entrepreneurs in Poland. The study of 2009 proved these barriers intensify with time\textsuperscript{57}.

We should note that problems in the UK usually do not result from the unwillingness to collaborate. Long lasting tradition of mutual relations between British universities and industry have made both parties aware of potential benefits resulting from joint projects.

The biggest obstacles for entrepreneurs is the fact that researchers perceive research as a long-term process. Respondents highlight that fierce competition on the market calls for dynamic changes, rapid responses to changing consumers’ needs and ensuring access to more innovative products, while too long waiting for the completion of research conducted in cooperation with universities discourages companies from deepening mutual relations. Almost 2/3 of representatives of companies are of the opinion that researchers have no time for joint projects. Their university work engages them so much, that they are unable to reliably work on additional projects with external partners\textsuperscript{58}. Almost 40% of entrepreneurs were also


concerned about the drive of academic staff to publish the results of their analysis as quickly as possible, which goes against companies’ interest. It leads to revealing company’s plans relating to the development of an innovative product, which means they miss an opportunity to surprise competitors. Ca. 1/3 of respondents say that scientists pay too much attention to basic research, which are of almost no value to business.

To complete the picture, we should add frequent disputes concerning intellectual property rights. British universities want to participate in the income generated by products they developed. Entrepreneurs object to it, they want to marginalise the role of universities, get credit for inventing a given technology, and profit from that.

Many British entrepreneurs stress negative impact of excess red tape on science and business cooperation and legal provisions, which effectively discourage both sides from establishing mutual relations. As we can see, unclear legal rules are typical not only of Polish reality. Neither are they satisfied with government initiatives designed to intensify such cooperation.

The above discussed barriers are the most often mentioned by British entrepreneurs, which does not mean, however, that there are no other obstacles, e.g. lack of knowledge on what universities offer or insufficient financial resources for cooperation in companies’ budgets. The overriding objective of this sub-chapter is not to precisely and exhaustively discuss difficulties, which accompany university-industry collaboration in the United Kingdom, but to show they are very similar to those experienced in Poland.

5. Potential and Opportunities of University and Industry Collaboration Taking Account of the British model

When analysing university and industry collaboration mechanisms in Poland we might conclude, that it needs deep modifications, which would lead to its smooth and efficient operation. Some elements of university and industry collaboration arrangements applied in the UK, Germany, and France could become models for drafting a successful system for Poland.

First of all, it is necessary to change the attitude of researchers and entrepreneurs, who should recognise that cooperation brings benefits to both sides. Authorities should focus on the building up of a centralised university and industry collaboration system to stop relying only on individual initiatives of some universities and companies. A good solution could be to set up a separate ministry,

---

60 Ibidem
which would directly deal with broadly understood innovation, as it is in the case of e.g. United Kingdom. In 2009 the Department for Business, Innovation and Skills (BIS) was established and one of its main responsibilities is to generate and monitor university and industry collaboration. Financial support for projects delivered in cooperation between academic centres and businesses comes e.g. from the Higher Education Innovation Funding (HEIF), which will allocate ca. GBP £600 mio (almost PLN 3 bn\(^61\)) in the period 2011 – 2015.

Besides, changes are required in the mechanism of establishing relationships between universities and firms. Universities should be sure that their scientific and research offer meets entrepreneurs’ expectations. Perhaps a good idea would be to create consortia of universities, which could develop a more comprehensive offer for business, better meeting its expectations. Another step should consist in the modification of knowledge transfer platforms, to make them more popular and clear for both parties to cooperation and to encourage using them actively. Following the UK example, companies cooperating with given academic centres could also establish representation offices at universities, which could promptly respond to problems arising from cooperation and correctly identify mutual needs.

Activities aimed at developing skills, both in students and in academic staff are critical for university and industry collaboration. Universities should modify their teaching curricula to give students knowledge, which they will be able to use in real economy. Developing a scheme of 4 – 12 – week internships in selected companies seems a good idea. Besides, research staff should also be able to participate in research and vocational internships, which would give them a better insight into companies’ needs and problems.

Science and business cooperation surely should not be a pro forma arrangement, without noticeable, measurable effects. Hence the government should consider the introduction of evaluation system for such cooperation, where the main criterion could be the number of submitted patent applications or successfully commercialised technologies. In the UK the system is known as the Research Excellence Framework (REF).

Polish authorities should also introduce further tax allowances to encourage Polish companies to improve their innovation performance. The possibility to allocate 1% of CIT for the support of selected research units announced by Polish government would be an excellent idea.

Development of such cooperation is impossible without the support of local authorities, which in Poland should engage more actively in into promoting it. Again, the United Kingdom may be a model for Poland and for the Lodz Region. Since 2011 the so called Local Enterprise Partnerships (LEPs) are established in the

---

\(^61\) Calculated at the GBP/PLN exchange rate of 03.08.2013
UK, i.e. companies initiated jointly by local governments and companies with representatives of local universities in their Supervisory and Management Boards.
Chapter VI

Recommendations for the Lodz Region in respect of University and Industry Collaboration

Results of studies, both theoretical and empirical, conducted within the project have led us to some recommendations concerning activities, which could stimulate improved innovation in the Lodz Region and to enhance university and industry collaboration. Though university and industry collaboration involves only these two parties, it is clearly influenced by the Regional Innovation System and its participants, e.g. local authorities and innovation support centres (Technology Transfer Centres, Business Incubators, technology parks, etc.). That is why we divided recommendations suggested for the Lodz Region into three groups:

- recommendations for enterprises (big, small and medium-sized),
- recommendations for science sector, and
- recommendations for regional authorities.

1. Recommendations for Enterprises

The studies present the companies in the Lodz Region as not innovative, not making efforts to change the situation, very much closed to new knowledge and learning from others. They create no or little innovations, do not cooperate to develop new solutions, and even when there is cooperation, it is on an ad hoc basis. Enterprises in the Lodz Region have little to protect so formal protection of IPR is rare. Despite limited access to capital, they use public resources to a small extent and engage mostly their own resources and bank loans as sources of funding. Moreover, if they have innovative solutions, they place them on the market on their own having no trust in potential business partners. Many companies from the Lodz Region, especially SMEs, do not analyse what other businesses do to acquire new knowledge, management procedures, organisational structures, business models, ways of funding commercialisation, and principles of cooperation with partners. Lack of knowledge on solutions applied by others, poses difficulties not only to improving innovation performance and competitiveness but also to expand to foreign markets.

Bad practices of companies from the Lodz Region result not only from systemic, structural, and culture-related barriers on which they have no impact. They are also due to the lack of awareness of the benefits of innovation, the absence of the
will to be innovative, and lack of appropriate competence. Changing the awareness of entrepreneurs and employees, building up adequate competences and perceiving innovation as an opportunity for growth and improved competitiveness are key issues, without which we will not be able to advance to the next stage, i.e. to establishing cooperation with science sector.

For the majority of companies in the Lodz Region the critical starting point is the change in awareness and thinking in terms of an innovative company. For such a change to happen in the minds of managers and owners, they need to learn good practices of innovative companies operating globally and try to adapt them to Polish circumstances.

The studies demonstrate that only ca. 12% of companies really manage innovation and even less, half of them, do that effectively. Thus, the task ahead is not easy. A long list of recommendations may be drafted. Small and medium-sized companies should:

- Have the will to be innovative, include innovations-oriented thinking in their operational strategies, and communicate the vision to their employees. It will require the support of company’s management for difficult decisions or new, radical directions proposed by the staff, courage and doing away with standard thinking and the past.
- Ensure that in the company there are people at important positions who stimulate and support innovation. These people should take care of technology/innovation, present the vision to other employees and to the management (the so called gate keepers) and encourage to take risks (the so called innovation champions).
- Put stress on internal entrepreneurship and efficient team activities. It is important to attach a lot of attention to combine various viewpoints and to set up ad hoc teams, more often go beyond boundaries within a company and between organisations: working remotely and in dispersed teams.
- Plan professional development paths, facilitate and create more opportunities to the staff, expand their horizons through training and delegating tasks.
- Maintain intense communication, create new channels for unconventional ideas, units which could receive unofficial signs of potential new solutions.

---

• Be deeply engaged in innovation. Develop internal programmes for searching and capturing new ideas in a company and to channel the energy and enthusiasm to implement them.
• Cooperate and maintain a network of relations with other operators on the market. They should go out of existing, efficient networks of relations to open up new opportunities (open innovations).
• Create the climate of creativity and the culture of innovation; develop internal entrepreneurship for the staff to be able to achieve the sense of fulfilment without looking for better opportunities elsewhere.
• Increase the number of highly skilled research and technical employees.
• More actively search for financial resources for R&D, both from public and private sources.
• Attach particular attention to the stage of an idea creation and product development in commercialisation. Companies should always carefully analyse commercial potential of new technologies, collect data, conduct analyses and develop a commercialisation plan.
• Analyse their own value chain and those of other partners, analyse threats and identify the required period of intellectual property protection.
• Maintain the status of a learning business, place bigger stress on practical knowledge and acquiring experience in accordance with the idea: fail fast, learn fast. They should expand training beyond the company and offer it to related parties.

In general terms, enterprises should learn how to skilfully manage innovations. Only when they change their mentality and the mentality of their staff, are they able to build relationships between university and industry. If enterprises are not mentally prepared for it, we can presume that the collaboration will be restricted and difficult.

2. Recommendations for the Science Sector

Poor university-industry collaboration in the Lodz Region is due not only to the weaknesses of enterprises. Also on the side of research units there are many areas, which need modifications and activities that could improve the situation and stimulate cooperation.

For many years, the majority of research conducted at universities in the Lodz Region have been basic research, requiring much time before they reach the stage of implementation or commercialisation. An important factor that could improve the situation with respect of university and industry collaboration is surely placing more stress on applied research and development works. Moreover, it would be
good to involve business representatives into the assessment of applications for grants. They would be able to learn about the scope of scientific activities of universities and research institutes and to initially review their applicability in economic practice. Already at the stage of planning research activities ideas of proposed research would be subjected to a market test.

Another solution, besides the participation of economic practitioners in assessing projects, which could stimulate university and industry collaboration is the introduction of a mandatory requirement to promote the results of research conducted within a project in business community, as a clause of project finance agreements. At present, research outcomes are published in scientific publications (monographs, journals, conference papers). Entrepreneurs’ access to them is limited and in fact, that is why they do not know what the researchers are doing and they do not feel the need to work with them.

A problem, which may contribute to limited university and industry collaboration, may be an inadequate system of researchers’ assessment in universities or research institutes. Modification of the system, in particular putting more stress on elements relating to cooperation with business, establishing of spin-off or spin-out businesses, and promoting university entrepreneurship, could make scientists more open to meeting and cooperating with business.

University graduates are an important link between universities and business. Research units should pay special attention to building relations with their graduates. Informing graduates about currently conducted research, annual meetings with them could encourage companies which they have started or work for to launch collaboration and increase trust in universities.

University of Lodz, Lodz University of Technology and Medical University of Lodz, all of them have their Centres for Technology Transfer. Yet, they not always accomplish functions for which they were set up. They deliver mostly educational projects, obviously very important, which, however, do not lead to the commercialisation of scientific and research works. The centres should focus on developing cooperation, finding the results of research works, that could be commercialised and giving real support to entrepreneurs and scientists. They should provide the bridge between universities and business. Nevertheless, studies show that very few entrepreneurs use their offers. A database including results of research presented in an easily understandable and accessible way would be useful for business people and could become the starting point for deeper interest in university offer. At present, the universities in Lodz have such offers but they are presented in a complicated language, little understandable, which discourages practitioners from browsing them. Such offers should be simple, clear and outline benefits that an entrepreneur may gain from cooperating with the university over a certain innovation (technology, results of research).
Making researchers more open to the needs of economic practice might also be achieved by the creation of a system (or a position) designed to search for research results, which could be applied in economics and evaluating their commercial potential at universities and individual faculties. The role is played currently by Centres for Technology Transfer, which are university units. Recruiting appropriately trained staff at faculties could improve the chances of finding the largest number of results possible and to evaluate them.

Research workers who wish to commercialise the results of their research or to establish spin-off and spin-out companies could be supported by a team of coaches (people familiar with management and commercialisation aspects), who would help them start businesses by offering their knowledge and expertise to place the results of scientific and research works on the market.

The key problem in university and industry relations highlighted in many studies is the lack of trust between partners. As we have already mentioned (see Table 1), the difference between research and business partners is deep, which reinforces uncertainties around the cooperation. A solution to the problem, helpful to both parties, could consist in strengthening the transfer of results and industry-university collaboration by building loyalty-based relations. Relationship marketing assumes the creation of a new value together with a customer, not for him. Loyalty programmes are long-term marketing operations, which should foster customers’ (enterprises’) links with universities. They are schemes consisting of techniques, which allow achieve the objective. The introduction of such loyalty schemes in Lodz research units could boost university and industry collaboration in the Lodz Region. That, however, would require research units to: estimate the market, identify parameters important for clients from the viewpoint of their expectations vis-a-vis innovative solutions, building a model of cooperation with key accounts, estimating customers’ value based on the assumptions to the innovative project, and developing key accounts portfolio.

3. Recommendations for Regional Authorities

As we have already mentioned, university and industry collaboration may take place between the two types of entities, however, the collaboration may be stimulated by other institutions, e.g. regional authorities. Adequate regional policy, financial support for innovation, promotion of innovativeness are very important for

---

64 A. H. Jasiński (ed.), Zarządzanie wynikami badań naukowych. Poradnik dla innowatorów, Faculty of Management of the University of Lodz, Institute of Technology and Exploitation, National Research Institute, Warsaw-Radom 2011, pp. 81-82.

building incentives for cooperation. As in the case of joint projects, also in the activities of regional authorities there are some areas, which, if better organised, could enhance cooperation between entrepreneurs and scientists.

Support for the development of cooperation networks in the region can be beneficial for the improvement of regional competitiveness and stimulate university and industry collaboration. A solution could also consist in doing away with allocating grants to individual entities in favour of promoting cooperation and focusing on specific types of economic activity (favourable for regional development). Then both, research units and businesses, applying for project funding would be, say, forced to cooperate and they could have an opportunity to get to know each other, build certain relations, which could lead to deeper cooperation in the future.

Regional authorities should also focus on support to the development of clusters and creative industries. Regional policy should also provide for education in creativity and entrepreneurship from the earliest schooling years. To cater for development needs of future-oriented industries preferred in the Region, regional authorities could propose to universities developing and offering courses on order, where classes would be largely delivered by practitioners. Such courses would call for cooperation between entrepreneurs and researchers, which could get the two worlds closer and help them understand each other.

An important step seems to be the introduction of incentives for entrepreneurs to collaborate with universities. Such incentives could consist in offering better opportunities to participate in the already mentioned projects involving research units supported with the EU funds. Another proposal would be to set up special borrowing funds with deferred payment terms available to university graduates, who want to start up an innovative business or to young entrepreneurs already running their businesses in industries preferred by the region.

In the Lodz Region enterprises create little innovation and that is why only a small percentage of companies protect their intellectual property rights. Support to innovation and entrepreneurship in the region should go hand in hand with promoting and familiarising companies with the protection of intellectual property rights. As the cost of IPR protection is very high, allocating certain funds to help entrepreneurs pay the cost of protection of inventions, industrial designs, and trademarks would be a valuable idea.

Promoting the model of open innovation, as an alternative attitude to IPR protection, could significantly assist university and industry collaboration.

Many small and medium-sized enterprises in the Region of Lodz are little innovative and operate mostly on regional market. Economic practice shows that companies present on international markets are much more inclined to implement innovations. This is because they must maintain certain standards, improve
competitiveness and they can observe what other companies do. Looking for new solutions, these companies more often cooperate with research units. From the point of view of improved innovation of the region and stimulating cooperation between enterprises and research units, it seems useful to draw attention to benefits for firms and the region from internationalisation of regional companies and ensuring **support to internationalisation of innovative companies in the Lodz Region**.

Assuming that regional authorities were to support and stimulate university and industry collaboration, it would also be worth developing a **system of technology brokers** at the regional level. The brokers would establish contacts between representatives of science and business to identify in detail their needs and to prepare the best offer for them.

Regional authorities may become a very effective element of university and industry collaboration system. As a result of studies conducted within the framework of the project, we propose a model of university and industry collaboration in the Region of Lodz providing for the support of regional authorities.

Its central point and expected outcome would be the Knowledge Platform (database of research works conducted in research units in the Lodz Region and needs of companies active in the region in innovation). The platform, which in fact would be a website, would permit research units promote the results of their research while entrepreneurs would be able to find results necessary for innovation, it could also become the source of further cooperation.

The platform must be, first of all, transparent and accessible when it comes to the content. Entrepreneurs do not have time to read long and complex descriptions and hence research presentation should provide:

- short description of research results,
- initial general assessment of commercial potential,
- benefits available to an entrepreneur as a result of the implementation of a solution or cooperation in its implementation,
- industries, sectors, in which a solution can be applied,
- contact data of the Centre for Technology Transfer or of the unit, which made the description available.

Descriptions of companies would contain key data about the company or data on its technological and innovative needs. Brief information without too many details leads to transparency and requires little time to read and find out if we are interested or not, but it is also a good way to protect intellectual property rights of research units and businesses.
Proposed model of university and industry collaboration in the Lodz Region with the support of regional authorities – Fig. 1.

Centres for Technology Transfer or persons designated by faculty deans authorised to do the job would draft the offers of research units. In companies these persons would be appointed by the management.

Before mentioned technology brokers engaged into the project by regional authorities would coordinate the collection of information. Brokers would be responsible for collecting data from research units and companies, supplementing and updating the content of the Knowledge Platform, analysing companies’ needs, analysing results of research available in the region, comparing and searching for research that could contribute to innovation and development of industries preferred in the region. Their important task would be to develop a system of easy search for information (results of research and companies’ needs divided according to different criteria, e.g. by industry, technology, etc.)

The platform itself surely will not produce visible results. The task of the region and of the brokers will be to disseminate knowledge about such a database.
and to explain benefits of it. Dissemination should focus on business circles as, according to the studies, they are less inclined to collaborate.

The above presented idea could be substantially supported by the application of a modified version of a solution referred to in the UK as a „pp concept” (practical professors) It refers to academic staff, who are members of management boards, supervisory boards, and committees monitoring certain development programmes. Similarly to many other Western European countries, also in Poland quite a substantial part of researchers combine their work at the university or a research centre with such functions. They know the needs for implementing innovation in companies much better than any other academics.

This is due to:

- their knowledge about the needs of companies or institutions where they are members of governing bodies,
- their knowledge of the sector (industry), in which these units operate,
- their being familiar with the needs of business in general.

They could become consultants at universities or research centres because there are rather few research units of primary importance to the region while there are many enterprises. They would operate as „hidden persuaders” as it is referred to in marketing, not only for universities but also for industry.

When cooperation between a research unit and business becomes more long-lasting, research and industrial consortia could be recommended as more useful. A consortium would imply the need to implement joint innovative undertakings, and financial resources for the development and implementation of innovation could come from various sources (financial engineering involving own resources of universities and businesses, but also venture-capital funds, business angels, bank loans and borrowings, institutional investors, such as: insurance companies, retirement funds, investment funds, European funds or other sources).

A consortium could engage more than one university and one business, it all would depend on the demand for innovations and on the size of a university or a company.

Rights and obligations of members to the consortium would be regulated by multi-party agreements concluded by universities involved into the consortium; The agreements should take care of interests of individual participants.

Attention should be drawn to how the rules of future participation in profits (or sometimes also in losses) connected with practical implementation of innovation are drafted.

The completion of collaboration within a consortium would mean a consortium is dissolved and there is final settlement of revenues and costs between participating parties. Efficient operation of a consortium would be based on
precisely and clearly outlined tasks of its individual participants, and taking account of time, within which the tasks should be accomplished.
SUMMARY

Results of studies collected in the course of the delivery of a research project “University and industry collaboration as a factor enhancing innovation in the Lodz Region” confirmed the common opinion that in Poland university and industry cooperation does not run smoothly, that it is restricted and does not produce satisfactory outcomes. The involvement of the foreign partner in the Project gave us access to unique materials, which offered a good insight into how university-industry collaboration is shaped the United Kingdom, Spain, and Germany, what solutions are applied and what effects they bring. Attention should be paid to the multitude of organisational arrangements and procedures applied in these countries to provide more dynamism into university and industry collaboration.

As the Project provided for regional studies, their results and importance for the Lodz Region are worth commenting. Despite the presence of many institutions, which should facilitate university-industry collaboration in the Lodz Region, the scale and effects of the latter are unsatisfactory. Moreover, although resources that companies in the Lodz Region allocate for innovation are relatively substantial, the Region occupies one of the lowest positions in innovation ranking in Poland. One may not disregard the fact, that measures of innovation are highly inaccurate and little objective. We should develop a collection of indicators that would measure innovation in companies in a more comprehensive and precise manner, together with effects achieved as a result of innovation.

Empirical studies allow us to conclude that the process of getting science closer to practice in the region should include:

- research units (universities, the so called business environment institutions, i.e. technology transfer centres, industrial and technology parks, business incubators, etc.), which are the source for ideas, new technological, organisational and personnel solutions,
- enterprises and institutions representing demand for the results of research, which boost their innovativeness,
- local authorities, which should create conditions for the development of entrepreneurship and innovation, especially when it is favourable for regional development.

On the one hand, the key problem is the lack of information about research conducted in the science sector and about how they could be used in practice. On the other hand, enterprises are reluctant to avail themselves of solutions obviously useful to them. Hence the idea presented in Chapter VI of a database that would
contain R&D works conducted in the region and the indicate demand of companies from the Lodz Region for innovation.

In parallel, the attitude of scientists and academics should substantially change when it comes to principles of cooperation. This is where the use of British expertise is vital. Scientists should pay much more attention to the usefulness of their research, i.e. they should focus on problems and research areas where the demand of economic practitioners is the highest, instead of areas, in which they have experts and researchers who have been working on their favourite issues for years. Practical utility of research works must increase also for the benefit of science as business people will pay only for results they are interested in.

On the other hand, economic practitioners should formulate their needs addressed to the research sector much more precisely and do not expect immediate results. Often researchers are expected to deliver quick remedies and immediate solutions, which, as we know, is impossible. We should not be surprised, however, with the impatience of the industry when commissioned research studies go on forever and still there are no measurable, satisfactory outcomes, which, regrettably, happens not only in exceptional cases.

To conclude, precise responsibilities and expectations identified by both partners, realistic cost calculation, full liability and trust should dominate the relationships between universities and industry.

That will help enhance innovation in Polish enterprises and operational efficiency of non-business institutions, which may also be more innovative, on the one hand, and, on the other hand, increase the share of business in financing the development of universities, in accordance with the model existing already for many years in developed market economies.