



*Research Article*

# Patent Protection Management for Research Results of Research Entities in Poland

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## Abstract

The challenges of the modern world and the development of individual economies require the implementation of various types of innovations based on knowledge and technology resources. For this reason, the role of research and development activity – carried out by various entities – has grown significantly in Poland as well. Due to the nature and scope of its research activities, the academic sector plays a specific role in this group. The aim of the article is to identify the scope and primary conditions for the patent protection management of the research results of scientific units in Poland, with particular emphasis on the situation of higher education institutions. The research undertaken, indicating selected phenomena accompanying the patent protection management of the research results of scientific and research entities, highlights some of the existing problems and dilemmas which must be solved i.e. still insufficient knowledge and experience of the scientific community in the relevant area, variable legal and regulatory conditions, costs and finance-related problems. The study was based on an analysis of domestic and foreign literature, analyses based on data provided by the Central Statistical Office in Poland, Eurostat, Polish Patent Office, European Patent Office and the use of deductive and inductive reasoning.

**Keywords:** R&D, research entities, patent protection management

## Introduction

Concern for the economic development of the country, strengthened by the fear of falling into the so-called 'middle income trap', justifies the need to increase innovation by moving away from the exogenous, i.e. imitative, model and towards an endogenous model based on independent creation processes and using

knowledge to spark innovation and technological progress. Such an approach requires strengthening activities aimed at stimulating research and development, the results of which would be widely used in economic practice and would contribute to the dynamic development thereof. The idea is to create innovations based to a greater extent on Polish ideas and discoveries. In the long term, only such discoveries can

provide a competitive edge to both individual entities and to the economy as a whole.

Research and development work in Poland is undertaken by a diverse range of entities, whose number – as indicated by statistics – is consistently increasing (Table 1).

**Table 1: Number of entities in Poland incurring internal R&D Expenditure in 2012-2015**

Sector	2012	2013	2014	2015
Commercial	2127	2467	2814	3735
Governmental	326	343	360	374
Higher education	217	222	217	219
Private non-commercial institutions	63	90	83	99
Total	2733	3122	3474	4427

Source: Based on data from Central Statistical Office in Poland

Due to the nature of the research they conduct, higher education institutions hold a special place among this group, as conducting scientific research is one of their basic functions. Furthermore, unlike other entities, higher education institutions carry out a full range of research (basic research, applied research, and development).

For many years, Polish innovation policy has been focused on increasing overall involvement in R&D activities not only on the part of research entities, but especially on the part of commercial entities (Máté, Oláh, Laknern, Popp, 2016, 163). The intensification and development of cooperation between both sectors is of particular importance. The point is that entities specializing in the acquisition of

new knowledge (scientific entities) should discover and create new solutions in areas of practical interest - enterprises which, by their very nature, usually have greater expertise in commercialization. As such, new knowledge can be used in the most effective way possible, which allows for achieving the goal of intensive development of both individual entities and the country as a whole. The result of using such a variety of tools and support programs, the level of R&D expenditure in Poland is gradually increasing, though is still not satisfactory (Table 2). It should be emphasized that the government also takes part in R&D activities, primarily in the higher education sector, state-administered research institutions, and other non-commercial organizations (Sawulski, 2018, 40).

**Table 2: Internal R&D expenditures in million EUR (GERD)**

Sector	2012	2013	2014	2015	2016*
Commercial	1276.34	1498.80	1800.09	2010.33	2700.43
Governmental	958.95	921.93	925.53	1052.99	103.37
Higher education	1181.02	1005.43	1126.78	1246.43	1290.43
Private non-commercial institutions	13.55	10.10	11.61	6.79	18.13
Total	3429.85	3436.28	3864.01	4316.51	4112.35

\* Provisional data, unverified

Source: Based on data from Eurostat

In practice, from the perspective of impact on increasing innovation and economic

development levels, the research results of the greatest value are those which are

suitable for practical use, those with commercial potential. According to the report on the R&D resources of Polish scientific entities prepared for the National Centre for Research and Development (NCBiR), in the period of six years (2015 - 2020), approximately 1000 - 1200 projects may be subject to commercialization, of which the total estimated value is about EUR 2.5 billion (NCBiR Report, 2015, 5-6).

From the point of view of development, technical inventions which have enormous potential for creating innovation in terms of new processes, technologies and products are of particular strategic importance. For this reason, such inventions and innovations – the results of scientific research – require special attention and an appropriate approach in the intellectual property protection and commercialization processes.

#### **The Concept of Scientific Research and the Legal Means of Protection Thereof**

A review of both the literature on the subject and Polish legislation allows us to conclude that there is no uniform definition of the term “scientific research results.” An analysis of the provisions of the Act on the principles of financing science (Act of 30 April 2010) indicates that scientific research leads to “acquiring new knowledge.”

In turn, art. 86a of the Law on Higher Education (2016) indicates that the results of scientific research may be both objects of industrial property rights (e.g. inventions, utility models, industrial designs, integrated circuit designs, etc.), and take a completely different dimension, e.g. as the result of artistic creation, therefore having the form of an artistic work.

The nature of the results of scientific research can be scientific (cognitive), i.e. leading to better recognition of reality and thus broadening the general state of knowledge, but also having a certain pragmatic value, i.e. the possibility of practical applications. While in the first case it would be important to disseminate

the research results as widely as possible, i.e. without restrictions, considering the use of results in business practice, i.e. through the prism of the potential commercialization processes, the issue of protection thereof may play a significant role.

The indicated diversity of the forms of scientific research results in the particular complexity of the protection process. There is no one means of protection applicable to every possible form of scientific research results. Even considering only the two most common forms of research results (i.e. works and objects of industrial property), the scope of existing legal tools and practical methods of protection is extensive. In essence, there are two means of protection, overt - based on obtained intellectual property rights, and covert - based on maintaining secrecy.

The objects of industrial property rights and artistic works may be protected based on the monopoly resulting from the provisions of both copyright law and industrial property law. While there are no formal conditions to be fulfilled for copyright protection (it is enough for the research results to be artistic works), applying for industrial property protection requires the completion of certain formalities at the patent office.

Formal legal protection of research results constituting industrial property is connected with the need to conduct specific administrative procedures (notification, verification, exclusive rights, etc.) and pay certain fees. The scope of required actions and procedures depends on the object of protection. Of such, the widest concerns inventions requiring patent protection.

From the point of view of scientific entities, among the various types of research results, inventions which may be patent protected are the most significant.

It should be noted that patent protection is fundamentally dependent on two basic issues, i.e. whether the invention may be covered by patent protection (whether it

meets the criteria set by law) and whether it is necessary to seek such protection. However, meeting the indicated requirements does not necessarily mean that applying for patent protection is necessary. Similarly, failing to fulfil such requirements does not necessarily mean that such inventions should not be submitted to the patent office.

If the protection of research results in a transparent manner is impossible or unjustified, it may be important to keep such results secret, which in practice means disallowing publication as well as physical and formal restriction of third party access. In this case, the obtained research results are treated as confidential, and access to such may be granted using a modular approach or the principle of gradual dissemination of information. The modular approach means full access to all information (contained in all modules) only

for a small group of people. In this situation, other participants have access only to partial results. In turn, the principle of gradual dissemination means the division of information related to the obtained results into several categories, e.g. public information, information provided to contractors after signing a confidentiality agreement, and key information made available only as a result of a commercialization contract, e.g. a license agreement.

### Patent protection activity in Poland

According to an analysis of statistical data, the interest in the legal protection of intellectual property (including inventions) in Poland is growing systematically. This indicates a growing number of patent applications filed and patents obtained (Table 3).

**Table 3: Number of and change in patent applications and patents granted to domestic entities from 2010-2016**

Description	2010	2011	2012	2013	2014	2015	2016
Number of patent applications submitted to the Polish Patent Office	3203	3878	4410	4237	3941	4676	4261
Year on year change as a %	100	121	114	96	93	119	91
Patents granted to domestic entities by the Polish Patent Office	1385	1989	1848	2339	2490	2404	3370
Year on year change as a %	100	144	93	127	106	97	140
Number of European patents validated in Poland	4516	5790	6710	7236	7380	7883	9871
Year on year change as a %	100	128	116	108	102	107	125
Number of patent applications filed with EPO by Polish entities	205	246	383	372	482	566	619
Year on year change as a %	100	120	156	97	130	117	109
Patents granted to Polish entities by the EPO	44	45	80	95	108	151	180
Year on year change as a %	100	102	178	119	114	140	119

Source: Own study based on Polish Patent Office (PPO) and European Patent Office (EPO) data

In the analysed period, the total number of patent applications submitted to the Polish Patent Office increased by over 33%, and the number of patents granted to domestic entities increased by over 140%. A more than threefold increase in the number of applications filed by domestic entities to the EPO should be assessed positively. Unfortunately, despite this, applications for patent protection outside Poland by Polish entities are still far fewer than such applications by entities from more developed countries. In 2016, patent applications from Poland accounted for

only approximately 0.3% and 0.2% of the total number of applications and the total number of patents granted, respectively, by the EPO. It should be noted that Poland is indicated increasingly often in patent protection implementation procedures conducted through the EPO. The number of European patents validated in Poland has increased by over 118% since 2010.

The activity of universities in terms of the number of patent applications filed with the Polish Patent Office (Table 4) is noteworthy.

**Table 4: Ranking of the top 10 entities which filed for intellectual property protection with the Polish Patent Office in 2015 and 2016. (more than 20 patents and protection for utility models)**

Position	Name	Number of applications
2015		
1	Wrocław University of Technology	119
2	West Pomeranian University of Technology	115
3	AGH University of Science and Technology	109
4	Lublin University of Technology	97
5	Silesian University of Technology	86
6	Krakow University of Technology	83
7	Poznan University of Technology	72
8	University of Wrocław	70
9	Lodz University of Technology	69
10	Warsaw University of Technology	65
2016		
1	Wrocław University of Technology	194
2	AGH University of Science and Technology	134
3	Lodz University of Technology	106
4	Lublin University of Technology	97
5	Warsaw University of Technology	93
6	Silesian University of Technology	80
7	Poznan University of Technology	70
8	Industrial Institute of Automation and Measurements (PIAP)	68
9	West Pomeranian University of Technology	61
10	Institute for Sustainable Technologies – National Research Institute	60

Source: Our own analysis of information from the Polish Patent Office

It is worth noting that the share of applications submitted to the Polish Patent Office represented by scientific research entities (including: universities, research

institutes, units of the Polish Academy of Sciences) has been similar for years, accounting for a total of around 45% of all applications. Of such, higher education

institutions account for over 50 percent. Similarly, when it comes to applying for the

European patents, universities are the leaders in Poland (Table 5).

**Table 5: Ranking of organizations reporting the highest number of patent applications to the EPO in 2015 and 2016**

Position	Entities from Poland	Number of applications	International entities	Number of applications
<b>2015</b>				
1	Gdansk University of Technology	23	Philips - EU	2402
2	AGH University of Science and Technology	22	Samsung - South Korea	2366
3	International Tobacco Machinery	14	LG - South Korea	2091
4	HS Wrocław SP. z o.o. [Ltd.]	11	Huawei - China	1953
5	Lodz University of Technology	11	Siemens - EU	1894
6	Poznan University of Technology	10	United Technologies - USA	1869
7	Selvita S.A. [Inc.]	10	Qualcomm - USA	1705
8	University of Szczecin	10	Robert Bosch - EU	1439
9	Pharmaceuticals Polpharma S.A. [Inc.]	9	BASF - EU	1384
10	Bomar S.A. [Inc], in administration	8	General Electric - USA	1316
<b>2016</b>				
1	Jagiellonian University	12	Philips - EU	2568
2	Pharmaceuticals Polpharma S.A. [Inc.]	10	Huawei - China	2390
3	Fakro Sp. z o.o. [Ltd.]	6	Samsung - South Korea	2316
4	Wroclaw Research Centre EIT + Sp z o.o. [Ltd.]	6	LG - South Korea	2313
5	Polish Academy of Sciences Space Research Centre	4	United Technologies - USA	1869
6	Polish Academy of Sciences Institute of Biochemistry and Biophysics	4	Siemens - EU	1871
7	Institute of Electronic Materials Technology	4	Qualcomm - USA	1704
8	Warsaw Medical University	4	General Electric - USA	1628

Source: Our own analysis of information from the EPO

In this respect, the situation in Poland differs from that in other countries. Overall, universities and other such entities generally account for 5-6% of patent

applications at the EPO. Most applications – over 65% – come from large companies. This does not mean, of course, that universities outside Poland are not

interested in patent protection for their inventions. On the contrary, universities in developed countries seek such protection very often. The number of patents obtained

in 2010-2015 by the 10 most innovative universities in Europe is presented in Table 6.

**Table 6: Top 10 innovative universities by the number of patents granted in 2010-2015**

Position	Name	Number of patents
1	University of Oxford	443
2	University of London	387
3	Technical University of Denmark	330
4	Pierre & Marie Curie University – Paris 6	305
5	University of Claude Bernard – Lyon 1	300
6	KU Leuven	292
7	Imperial College London	281
8	Swiss Federal Institute of Technology Zurich	276
9	Ghent University	238
10	Federal Polytechnic School of Lausanne	235

*Source: our own analyses of information from Reuters Top 100 European Innovative Universities Comparison 2017*

Foreign universities submit several to several times more patent applications than the best universities in Poland in this respect. For example, for many years, the most active higher education institutors have been the University of California (434 PCT patent applications in 2016), in 35th place, and the Massachusetts Institute of Technology (236 applications), in 83rd place (Patent Cooperation Treaty, WIPO, 2017, 32).

#### **Determinants of patent protection management at scientific entities in Poland**

The increased importance of intangible assets in the development of individual organizations and the economy at large, globalization processes, and the whole spectrum of consequences thereof (including qualified workforce mobility, accelerated technical progress, market expansion, shortening product and technology life cycles), along with intensive ICT technology development, mean the issue of protecting intellectual property is not as simple and obvious as it seems. There are a number of dilemmas, ranging from whether how to protect such property, how to manage intellectual property protection in order to avoid basic mistakes and to solve problems arising in

this area (Wiśniewska, 2016, 270). These issues also concern the protection of various types of scientific research results, in particular technical inventions.

The need to move away from the “closed innovation” model toward the so-called “open innovation” model is ever more apparent (Pachura, 2017, 175). These trends are additionally strengthened by the resulting increase in innovation levels and by the “free revealing” concept, and will certainly affect the current R&D management models in the coming years. This does not mean, however, that the protection of inventions is any less important. As results from research and observation, the “open innovation” model and the abandonment of exclusive rights to inventions stimulate first and foremost the appearance of imitation inventions. In turn, breakthrough solutions are created in closed systems and require protection, which may provide their creator with a kind of gratification for the risk and effort (financial, organizational, and temporal) involved in development and commercialization thereof (Wiśniewska, 2017, 315).

Without indicating whether the monopoly resulting from the patent is actually a stimulator or barrier to innovation

processes, it should be stated that there are a number of factors affecting the decisions of an entity in this respect.

According to the analyses conducted, almost half of all inventions in Poland are the work of scientific and academic institutions, whose patent activity in comparison with other sectors is higher than in other developed countries. There are a number of factors determining whether patent protection is undertaken.

In addition to the obvious potential advantages and disadvantages of this type of protection, which may encourage or discourage any inventor within a certain scope, there are some conditions which are particularly important from the point of view of the academic sector. A summary of the basic stimulating and inhibitory factors, as well as the advantages and difficulties associated with patent protection from the point of view of the academic sector in Poland, is presented in Table 7.

**Table 7: Essential stimulators and barriers to applying for patent protection from the point of view of the academic sector in Poland**

<b>Stimulators (benefits)</b>	<b>Barriers (difficulties)</b>
<ul style="list-style-type: none"> <li>• A temporary, formal monopoly under intellectual property rights which may be subject to transfer;</li> <li>• Allows for trade in intellectual property rights and financial gain from licensing;</li> <li>• Allows for access to information on other technologies</li> <li>• Positively affects the image of the scientific entity (a kind of confirmation of its scientific potential)</li> <li>• Has a positive effect on the assessment of employees in the evaluation process</li> <li>• Positively influences the assessment in the process of parameterization of a scientific entity</li> <li>• Requirements of internal university regulations regarding intellectual property protection, resulting from the Higher Education Act</li> <li>• Formal requirements in the implementation of a number of types of scientific projects financed from public funds</li> </ul>	<ul style="list-style-type: none"> <li>• Requires disclosure of the invention and strict adherence to procedures related to the acquisition and use of protection rights (e.g. as regards time monitoring and the manner of disclosure)</li> <li>• Risk of rejection, prevarication, or lack of the so-called “purity” of the patent</li> <li>• Difficulties in assessing the commercial potential of the invention</li> <li>• Costs related to obtaining and maintaining protection and claiming exclusive rights</li> <li>• Significant difficulty in the construction and presentation of scientific achievements for the needs of scientific promotion procedures, resulting, for example, from the prohibition of earlier disclosure of research results, which are the basis of the invention</li> </ul>

*Source: Our own analysis*

Aiming to support the commercialization processes of the results of scientific research as well as implementation of European Commission and WIPO directives regarding intellectual property management as part of activities related to the transfer of knowledge, the Ministry of Science and Higher Education in Poland, by way of amendment to the Law on Higher

Education, obliged subordinate units to create the organizational and administrative conditions necessary for the proper management of intellectual property. On this basis, universities have developed and implemented relevant regulations and strategies. This activity has become one of the additional stimuli of the patent activity of the academic sector.



However, despite the fact that patent protection of research results should favor the processes of commercialization thereof, in Poland, paradoxically, few of the inventions reported by scientific entities to patent offices find practical application in the economy. This thesis is confirmed by research audit activities of research institutes conducted by the Supreme Audit Office (NIK), which established that only 20% of patents obtained by research institutes, 14% of patents belonging to units of the Polish Academy of Sciences, and 4% obtained by universities were subject to practical use (NIK Report 2015, 21).

The existence of a problem with the commercialization of research results generated by scientific units is quite commonly emphasized, in turn translating into low effectiveness of the research undertaken and expenditures incurred for such purpose (including the costs of applying for legal protection). It should be emphasized that in developed countries less than 50% use of patented developments in practice is considered ineffective.

According to the NIK report, in 2011-2014 commercialization activities and the valuation of protected technologies concerned only a few percent of the intellectual property owned by the universities audited (NIK Report 2016, 46-47). This situation may result from several factors, among which one stands out: lack of financial resources for implementing the patented solutions, low implementation/commercialization of patented inventions, non-economic reasons for filing patent applications, e.g. requirements for settlement of funds raised from EU funds or criteria for parametric evaluation of the university.

Moreover, a noticeable phenomenon in the case of inventions reported by universities in Poland is the relatively short period of patent protection. In 2011-2013, on average, 43% of patents awarded in a given year expired the end of the respective year. Only 28% of patents remained in force after 2 years. The data indicate that universities forgo protection for a

significant number of inventions in the shortest possible time due to the lack of implementation potential, and the only reason for applying for legal protection thereof is to obtain the appropriate score in the parametric evaluation, which translates into funding for scientific entities in Poland (NIK Report 2016, 46-47).

## Conclusions

The specificity of the situation in Poland compared to other developed countries in the world is based on relatively high application activity of universities in comparison to business units. As it appears from the presented rankings, in Poland, universities occupy the highest positions in terms of complex patent applications for both PPO and EPO.

The research undertaken, indicating selected phenomena accompanying the patent protection of the research results of scientific and research entities, highlights some of the existing problems and dilemmas which must be solved.

So far, tools to stimulate the commercialization processes of research results in Poland (including incentives to protect the intellectual property of the academic sector), as it turns out, do not sufficiently contribute to the stimulation of such processes.

Despite the fact that the level of patent protection applied for by research units in Poland is consistently growing, it is still significantly lower than the number of applications filed by such entities in more developed countries.

Another problem is the low percentage of practical implementations of university patents. Certainly, this situation is the result, inter alia, of the lack of a sufficient cooperation with the business sector. One of the basic reasons for this state of affairs is the generic structure of R&D works carried out in Poland. An important disadvantage of this structure, especially in the case of universities, is the relatively large share of basic research in relation to applied research and development works.

Consequently, this means little or no cooperation between the two sectors in the field of scientific research (Janasz, Wiśniewska, 2017, 20).

The reluctance of enterprises regarding solutions (inventions) proposed by universities is often due to the lack of information on the technologies offered, or the perception of such as requiring considerable expenditure and failing to take into account the current competitive conditions. This is related to the specificity of work on so-called “university technologies,” which to a greater extent focuses on the search for discoveries than the application thereof. Therefore, these technologies are often completely new to the market and, while remaining at the early stages of their life cycle, usually require more investment to develop or build appropriate competences for practical application thereof (Trzmielak, 2013, 116-117). Therefore, although they may potentially have a strategic competitive advantage, they are associated with greater risk and expenditure, and thus are of little interest to enterprises, especially from the SME sector, which is dominant in the Polish economy.

The following, among others, are not without significance with regard to commercialization and research result protection problems in Poland: still insufficient knowledge and experience of the scientific community in the relevant area, variable legal and regulatory conditions, costs and finance-related problems. The identified barriers to commercialization are many and various, including economic, legal, mental, etc. The abolition of such barriers would certainly stimulate science and research entities not only to widely undertake further research work, but also economically justify the processes of applying and maintaining patent protection for inventions which were initiated by universities.

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