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**RESEARCH AND SERVICES PROVISION
ON THE WORLD RESEARCH MARKET**

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Abstract

It is necessary to create new knowledge for the development of the economy. The source of new knowledge are research: basic, applied and industrial, which complement each other to form one whole. Each of these research has other sources of financing and other purposes. Due to the large influx of foreign technology to Poland industrial research is not growing as we would expect. To balance this deficiency the Research Institutes may provide services on the world market. It would be advisable to seek the provision of services on the global research market so that it could become a Polish smart specialization. This specialization would include the sale of intellect, which should never run out of customers.

Keywords: new knowledge, research, basic research, applied research, industrial research

Introduction

A necessary condition for conducting research activity is having appropriate financial assets. These assets are provided by sponsors or clients. Sponsors usually agree to subjects of research proposed by researchers or consortia of researchers. At the same time, the one who orders research, defines the subject, goal and scope of research, as well as the form of provision of effects himself. In research institutes these two forms of financing are usually intertwined and mutually complementary.

Assets allocated by sponsors to financing research are:

- statutory subsidies;
- financing research projects;
- financing research-development projects.

Assets provided by clients for financing research are:

- government orders;
- industrial orders;
- financing didactics and training.

It seems unnecessary to even discuss the claim that the existence and functioning of the research sector is a necessary condition for the social and economic development of the Country. Social and economic development of Poland (similarly as in the whole globalized world) is based on two foundations:

- own research;
- transfer of knowledge and technology from abroad.

Sponsors of own research expect researchers to provide particular effects such as:

- publications;
- patents;
- "demonstrations" of technologies.

As sponsoring includes public funds, audits, as well as assessments and categorizations of research institutes are being carried out. The number of publications and patents created in Poland is being statistically compared to data from other countries. Adopting the number of publications as a measure of efficiency of science, in 2011 there were 310 publications per one million inhabitants in Poland, this is equal to a half of the European average. Another measure of innovativeness is the number of patents. In 2011 the number of patents in Poland per one million inhabitants amounted to 1.18. At the same time in Switzerland the ratio was 321.80, in Germany it was 166 and in the Czech Republic it was 5.22 [1]. The number of patents granted to Poland by the European Patent Office reached 45. At the same time 13,583 patents were granted

to Germans and 55 to Czechs. This number of patents obtained by Poland is regarded as far from satisfactory.

The orderers expect research results that can raise their revenues from sale of products and services.

In the recent years the transfer of technology to Poland was associated with privatisation and takeovers of national companies by foreign investors. The transferred technologies enabled rapid growth of competitive potential and productivity of national economy. National scientific-research infrastructure contributed only very little to this growth. This situation also had an impact on the state and directions of development of this infrastructure, which is suffering from shortage of significant industrial orders.

In the article primary, applied and industrial research are analyzed in terms of their goal and utilization under conditions of major shortage of orders for industrial research.

The goal of the work is also to substantiate the claim that under the circumstances of influx of foreign technologies, a compensation for the shortage of industrial orders may be intelligent specialization formulated under the notion of: „provision of services on the global research market“.

Basic research

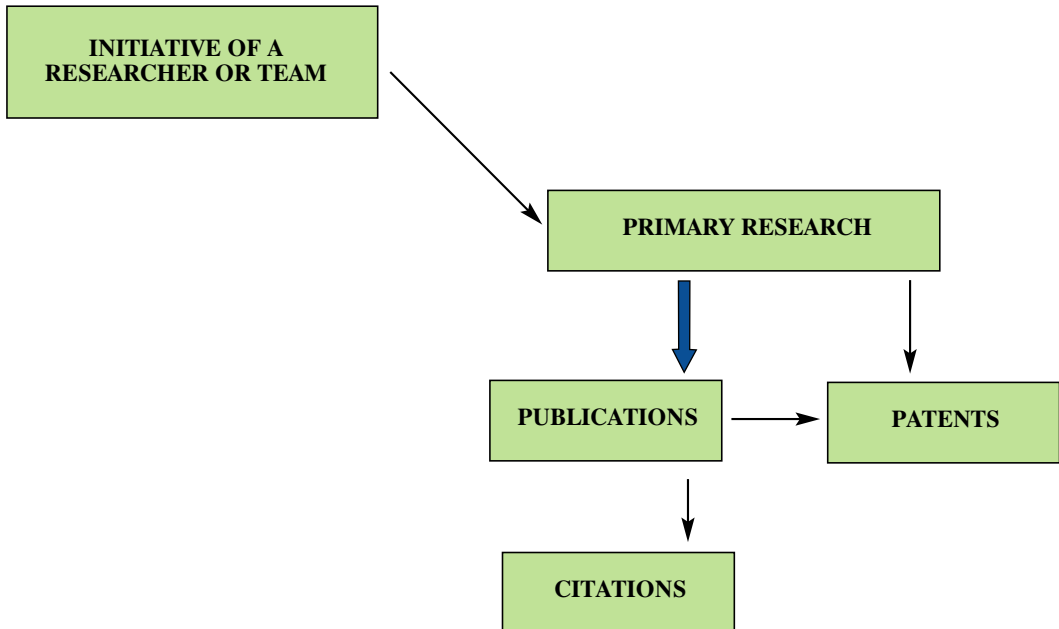
Among the group of primary research there are research projects sponsored by the National Centre for Research and Development, European Commission and others. The goal of primary research is to learn about new phenomena, scientific development, development of cooperation, integration of the research sphere and consolidation of the research potential. A measure of effects in this group are publications and lectures at conferences, patents are further down on the list. There is a perfectly reasonable rule here, namely that research results don't exist objectively until the moment when they are published. Research teams as a result of conducted works gain knowledge and create new knowledge and experience, document their achievements through publications. Experience, new knowledge and their generalizations constitute a basis for obtaining scientific titles and achieving scientific promotion. Publications boost the positions of researchers and research teams in the world of science. This has a direct result in form of the possibility of gaining new grants, scholarships, subsidies.

Primary research is conducted on the level of a few first levels of readiness of technology, which usually means that researchers don't have to worry about commercialization. If as a result of research patents are registered, commercialization is discussed in course of utilization of these patents.

In this case, “in a sense” commercialization is replaced by references of other authors to the published research results. Research classified as primary research has a particular impact on the didactic processes and raising the lecturers' skill level. Eventually, this leads to making studying at a particular university more attractive.

Summing up, the goal of primary research is to create new knowledge and development of creative scientific staff. The effect are publications, papers, lectures, seminars, and eventually patents. What is characteristic about primary research is lack of pressure on commercialization. Lack of this pressure shapes the area and style of work of researchers. The structure of basic research is presented on picture 1

Picture 1. Structure of primary research



Source: Own materials.

Applied research

In the group classified as applied research there are research projects sponsored by the National Centre for Research and Development, European Commission and other institutions. The goal of this research is building demonstrators of technology

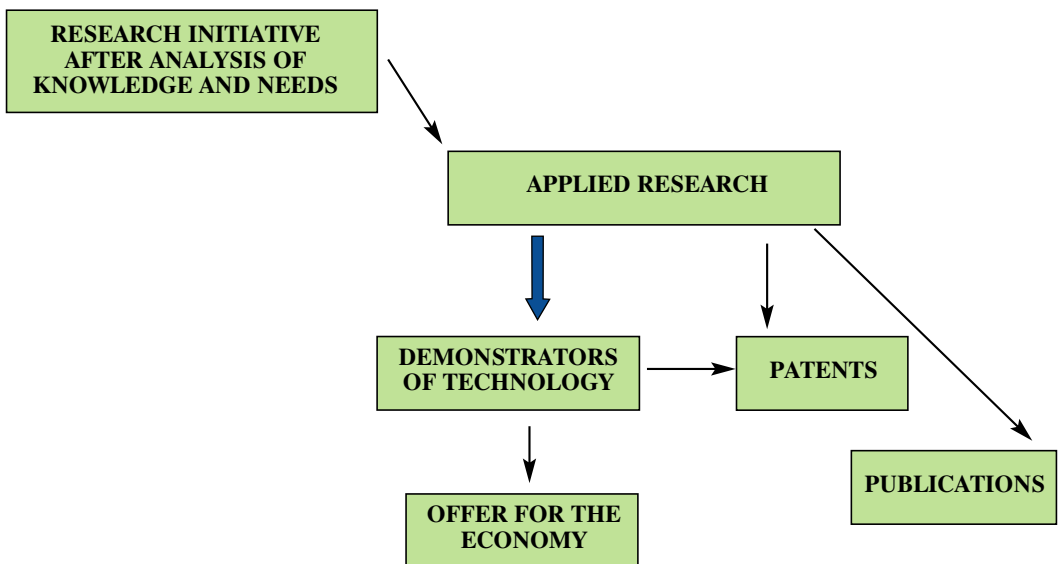
on the level allowing their industrial and commercial utilization. The condition of conclusion of research at the level of advanced demonstrator of technology determines the scope and organization of research. Here appears the pressure on achieving results that in the future could likely be verified in practice. This trait substantially distinguishes applied research from primary research. In case of applied research the goal is not just to learn about new rules and phenomena, but also to come up with particular proposals for application of the developed solutions in practice. Out of necessity, in applied research the publication of results is not a priority any more. What becomes much more important is patenting new solutions and ideas.

New knowledge and experience gained in applied research, similarly as in primary research, are a material for generalizations, obtaining scientific titles and promotion.

The goal of applied research is creating for the economy an offer of starting the production of new goods, applying new technologies, new organizational methods or providing new services. The effect of applied research is also the creation of new knowledge and education, as well as development of creative staff able to shape competitive and innovative economy.

The structure of applied research is presented on picture 2.

Picture 2. Structure of applied research



Source: Own materials.

Industrial research

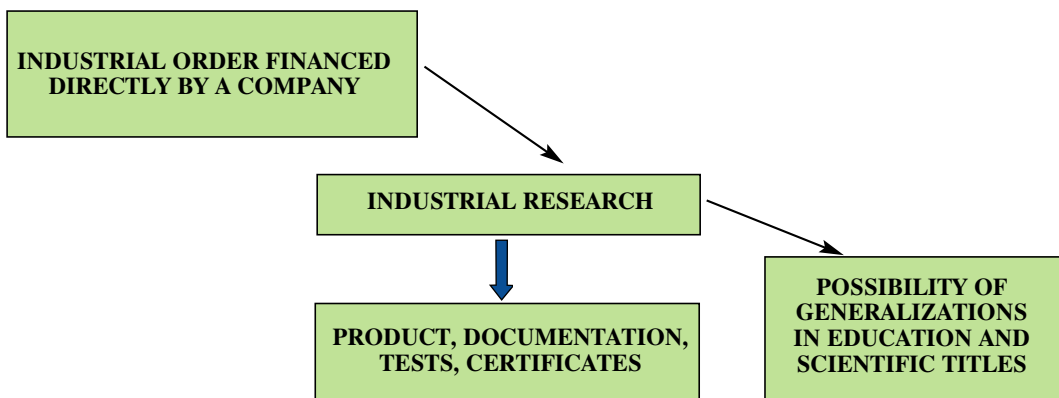
Industrial research is research ordered directly by the industry, economy, public services. The client ordering research presents his requirements, specifications, expectations and technical conditions for research. The market waits for the results of this research. The researcher “feels the market breathing down his neck”. This kind of research requires appropriate organization of work, they also generate special requirements with regard to staff.

The client is also the owner of research results. This means that researchers have no right to patent and publish results. The process of research and research infrastructure require possession of certificates and applying formalized procedures. Some industrial research projects constitute services perfectly fit for collecting statistical experiences. A substantial percentage of such research projects are highly advanced projects characterized by highest level of innovativeness and novelty.

Even though industrial researchers create new knowledge and gain unique experience, they often abandon their formal scientific career, being unaware of the fact that their unique knowledge can constitute material for generalizations and exceptionally valuable doctoral theses and scientific careers.

The goal of industrial research is creating new products, technologies and services directly expected by the market — companies, concerns. Thanks to this research companies get a chance to keep and strengthen their competitive position on the market. The effect of industrial research is also the education and development of creative staff leading in creativity, innovativeness and progress. The structure of industrial research is presented on picture 3.

Picture 3. Structure of industrial research



Source: Own materials.

Internationalization of research

The contemporary model of conducting research emerged in the reality of globalization, including common access to knowledge, computerization and free market of research. In this reality cooperation and joint work on research in international teams mixes with ruthless competition on the market [2].

Primary research perfectly fits the model of internationalization. The utilization of international and own funds, joint research, exchange of results, meetings and conferences, publications with international reach constitute excellent examples of this. For this reason, the number of publications per one million inhabitants is at a sufficient level in Poland.

Applied research, which is aimed mainly at building demonstrators of technologies and patenting don't bring sufficient effects in the scope of patenting. Perhaps, the reason for this are long and time-consuming patenting procedures, especially in the European Patent Office. Undoubtedly, one of the important reasons is small number of big research projects and lack of demand for them in the national industry.

In the group of industrial research we are dealing with the lack of orders from national industry. This stems from the fact that big companies in Poland, following privatisation, take advantage of technology delivered by foreign investors, technologies worked out in foreign research centres.

In the group of industrial research the basic challenge is finding clients who are in short supply or are missing within the country. In the group of industrial research internationalization is a chance to find orders. In order to obtain orders for industrial research, it is necessary to look for clients abroad.

For the purpose of industrial research, it is necessary to create:

- strategy;
- system of promotion and acquisition;
- system of support.

The most creative and advanced research projects shouldn't be abandoned.

Provision of services on the global research market as an intelligent specialization of the sector of education and research

Analysis of three groups of research: primary, applied and industrial suggests that in each of these groups research is addressed to a different kind of recipient. The recipient of published primary research projects is the world of their potential users in science and

economy. Applied research constitutes an offer for entrepreneurs and are currently addressed to small and medium companies in Poland. Big national companies take advantage of research and technologies worked out in foreign centres. There is a shortage of orders for national research and big strategic programmes. Applied research addressed to SME's cannot compensate for this shortage, In this complex situation the only solution is looking for orders for cooperation in the area of industrial research on the global market. What serves the purpose of this search is the strategy titled Provision of Services on the Global Market of Research. Provision of services on the global market of research is also a real proposition for Polish specialization with regard to the sector of science and research. Such specialization could satisfy national ambitions and generate revenues from exports of intellect. Exports of research services would also enable the utilization of Polish research infrastructure built in the recent years.

Suggested assessment of internationalization of research institutes

Considering internationalization as one of criteria and classification of research institutes. This assessment would cover:

- list of publications in foreign magazines;
- list of conferences organized by an institute abroad;
- list of international conferences organized by an institute;
- list of lectures given abroad;
- list of patents obtained abroad;
- list of presentations at fairs and exhibitions abroad;
- list of conducted projects co-financed with foreign funds;
- list of foreign clients and partners together with the scopes and effects of cooperation;
- percentage of revenues from foreign sources in total revenues of an institute.

Summary and conclusions

In the paper three kinds of research — primary, applied and industrial research — were discussed and compared. It was pointed out that all three kinds of research have common traits, namely:

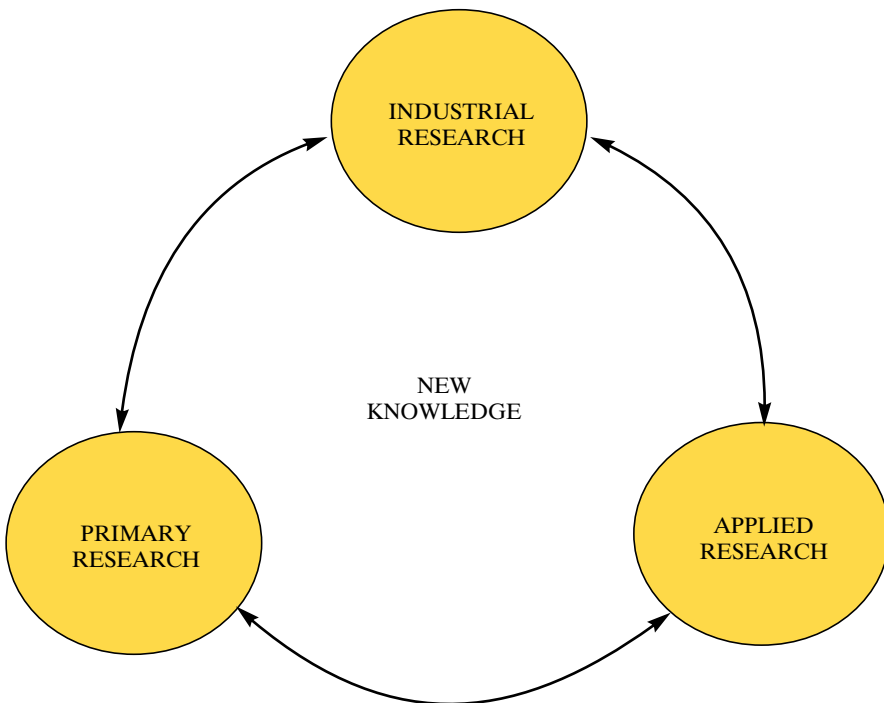
- creating new knowledge;
- creating and developing creative staff;
- social and economic usefulness.

Different sources of financing of particular kinds of research determine their utilization, as well as the manner and place of presentation. The eventual examples of this are: the necessity to publish results on the one hand and keeping them completely secret on the other hand. Regardless of that, there is also the possibility to generalize them and use in education and scientific development.

Considering the absence of the market of industrial research in Poland, it was pointed out that it is possible to compensate for this absence by providing services on the global market. It was emphasized that provision of services on the global research market could be one of intelligent specializations of Polish economy. Three kinds of actions aimed at achieving such specialization were proposed:

- financial support for such activity eg. by subsidizing the development of laboratory infrastructure;
- taking up marketing offensive;
- introduction of "internationalization" as one of criteria of assessment of Research Institutes;

Picture 4. New knowledge — common trait of primary, applied and industrial research



Source: Own materials.

It is worth emphasizing once more that industrial research constitutes a significant factor in creation of new knowledge. The proposed supplement for the lack of research for national industry is provision of services on the global market. Provision of services on the global market of research is a specialization in the new generalized dimension. This specialization doesn't concern a particular product or service, but a broad spectrum of activities. This specialization constitutes exports of intellect. This specialization can be resistant to fluctuation of economic trends, needs and fashions on the global market, more than any other.

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Associate Prof. Witold Wiśniowski, PhD Eng. — doctor, engineer, mechanic, graduate of the Faculty of Power and Aeronautical Engineering of the Warsaw University of Technology and the Faculty of Mathematics and Mechanics of the University of Warsaw. Since 1993 the director of the Institute of Aviation.

He has been continuously conducting scientific activity in the area of dynamics of construction of flying objects. He is the author of a monograph titled "Badania rezonansowe obiektów latających — metody i analiza wyników" (Resonance imaging of flying objects — methods and analysis of results) and 30 other scientific publications from, among others, the area of international cooperation and management, about 60 papers, 5 patents.

His whole professional career is associated with aviation and the development and future of the Institute of Aviation have become his passion, goal and dream.

For 14 years he has been organizing the annual Polish-American Conference on Science and Technology, he participates in the works of the Management of the Association of European Research Establishments in Aeronautics EREA, he is an active member of the Association of Polish Mechanical Engineers and Technicians SIMP, Main Council of the Research Institutes and Committees of the Polish Academy of Sciences. He was a co-creator of the Association of Aviation Industry (Stowarzyszenie Przemysłu Lotniczego), and in the years 2001–02 he was the head of the association, now he is a member of top management of the association. Initiator of the cycle of conferences titled "Marketing of Scientific and Research Organizations".



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