THE ROLE OF SCIENCE AND TECHNOLOGY PARKS IN COMMUNICATION PROCESSES BETWEEN RESEARCH INSTITUTIONS AND INDUSTRY
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Abstract

Among the ways to bridge the gap between the research communities and the industry, one of the best known are the Science and Technology Parks. The scope of the offered services, the scale of operations and their revenues vary considerably. The largest parks gather companies, whose revenues may reach billions of dollars. Achieving such success requires, from the park operators, much more than offering attractive prices for office space. Moreover, it requires well-coordinated activities, based on a long term vision, from the central governments. The paper presents an analysis of the factors determining the success or fiasco of science and technology parks, both in worldwide and Polish context.

Keywords: science and technology parks, communication, efficacy, services
Introduction — the history and role of science parks

The establishment of science parks was inspired by the idea of creating optimal growth conditions for business and innovation (largely technological innovation) through providing physical proximity at one convenient location. Such proximity was supposed to support collaboration between entrepreneurs and science communities, foster the sharing of ideas and promote joint realisation of projects. The history of science parks goes back to the 1950s, when the first science park was established at the Stanford University in the US. The subsequent pioneering enterprises included the Cambridge Science Park in Great Britain and the Sophia Antipolis Science Park in France, created over a decade later. The concept of science parks gained new currency first in highly-developed European countries in the 1970s and later in the dynamically growing Asian economies in the late eighties and early nineties of the twentieth century. Today there are thousands of institutions using the title of a science or technology park or a variant of this name.

Despite the long history of science parks, a clear definition of a science park and its role has yet to be formulated [1]. Inside one country or region, economic, social and cultural diversity occurs alongside differences in objectives and ways in which science parks operate. Moreover, the criteria used for science parks' performance evaluation vary considerably.

Some countries have introduced, if only for tax reasons, a number of formal criteria an organization has to comply with if it aspires to the status of a science park. And so the United Kingdom Science Park Association provides a clear definition of a science park and related institutions such as business incubators or innovation centres. A science park is defined as a cluster of knowledge-driven companies which are provided support and business advice to foster their growth. In the majority of cases, science parks are tied by formal contracts to technology centres such as universities or research centres actively providing knowledge and technology transfer management services. Other countries might however adopt a slightly different approach for example in Germany there are business and technology parks with an equal focus on services based on university research capabilities and business services such as office and production space rental aimed at stimulating the local economy [2].

In Poland, science and technology parks vary considerably with respect to their aims, conditions and operation models. Given this diversity, it might be useful to refer to the

1 http://www.ukspa.org.uk/about_ukspa/faqs_about_ukspa/
definition of a science park presented in a report on science and technology parks by the Polish Supreme Chamber of Control (NIK): [3]

A Technology Park is an organization managed by qualified specialists whose objective is to improve the well-being of the community in which it operates through the promotion of an innovation and competitiveness culture among entrepreneurs and knowledge-based institutions. In order to achieve these objectives, a technology park stimulates and manages knowledge and technology transfer between universities, R&D centres, business organizations and markets. A technology park facilitates establishing and developing knowledge-driven companies through creating business incubators and spin-offs or spin-outs. A technology park creates added value to the on-park firms through providing top-quality services, high-standard facilities and a prestigious location.

An alternative approach to defining the role and effectiveness of technology parks is based on specific tasks and objectives they deliver [4, 5, 6]. This approach allows for the selection of functions an institution wants to fulfil, the evaluation of its effectiveness in the selected scope and, finally, making suggestions as to how a park's objectives should be modified. The objective-oriented definition is dynamic.

The list of deliverables might include:

- Knowledge transfer, direct contact between research institutions and business companies (one-to-one communication as well as planned wide-reaching activities such as workshops, conferences, training session etc.);
- Personnel transfer, including transfer of founders of spin-off/spin-out companies and key personnel from research centres to firms;
- Support and conduct of contracted research (research conducted at a research institution ordered by business firms) aimed at developing innovative products or technologies;
- Innovation implementation management: research and development, design, analysis, testing, certification, advice on achieving Technical Readiness Level and Manufacturing Readiness Level);
- Effective communication of goals, conditions and expectations of research community and business, looking for a “common language”;
- Business advice (directed to both researchers and entrepreneurs) in the area of defining goals and expected economic results, risk mitigation, and commercialization of solutions developed;
- Business coaching;
- Support for protection and exploitation of intellectual property;
- Legal services;
- Administration support and services;
- Access to R&D resources (laboratories, expertise, prototype works), which are business-oriented and configured to commercial use;
- Facilitating informal contacts between different groups (researchers, engineers, business people etc.);
- Creating an environment conducive to co-operation, sharing of ideas and creativity;
- Facilitating contacts with subcontractors (both through creating the added-value chain on the park and through providing legal external contacts management services;
- Office space rental and ICT services;
- Ensuring or facilitating access to sources of capital (venture capital, banks, other sources of financing);
- Attracting capital through extending formal and informal quality guarantees to tenant firms.

Obviously, individual science parks can only deliver certain types of services. The key factor distinguishing a science and technology park from other entities in business environment is its close ties to an active research community. If this element is missing from the range of services offered, it is clear that an institution does not have a scientific or technological character.

The above statement has no negative implications: business incubators, business parks or special economic zones have, each in its domain, an important and positive role to play. However, when planning financing of an institution it is necessary to clearly define its role and expectations. This problem will be addressed later via the case studies, concerning in particular science and technology parks operating in Poland.

Success factors

Given the enormous diversity of the objectives and scope of activity of technology parks it is impossible to designate one universal success gauge. But if we accept that the main reason behind creating science parks is the desire to support high-tech industries and to create conditions conducive to the growth of innovative enterprises, then the best (though indirect) evaluation method is to study the parks' contributions to the growth of these economy sectors and enterprises.
Valuable insights might be also gained by comparing the economic indicators concerning tenant firms and firms operating outside science and technology parks. An attempt at such a comparison, concerning Sweden (a highly developed country with strong innovation culture) can be found in publication [4]. The conclusions reached by the authors seemed to be quite surprising: although technology-based firms located in science parks did have a significantly faster rate of growth of sales and employment, this was not reflected in higher profits (an element of utmost importance for capital funds, VC or business angels). Even though it is supported by a science park, a firm may need considerable time to achieve high profitability levels, depending on the situation on the market. Another unexpected observation was that there were no significant differences between park-based firms and their counterparts operating outside such structures with respect to enhanced R&D outcomes (e.g. a higher number of patents). Obviously, not all results of successful development work are visible in the form of patent applications. In fact, applying for a patent might be even harmful for a firm. A much more effective model of protecting an innovation is to keep it secret. Hence innovation indicators might not be reliable. Siegel, Westhead and Wright [7], analysed the impact of the UK university technology parks on business innovation and observed only a slight growth of efficiency in science park-based firms. The same work brings attention to the fact that using the number of patent registered as a business success indicator is faulty from the economic (so, essentially, the most important) point of view. Much better, although considerably harder to obtain, would be the results of the analysis based on the value (revenues, income) brought about by innovation (including patented innovations and innovation treated as a closely guarded company secret or its know-how).

Purely economic criteria (turnover, profit, employees) are key for long-term performance evaluation of science parks. However, to evaluate the effectiveness of the support provided by science parks it is necessary to refer to a carefully selected group of firms operating outside science parks in the same market and offering similar products or services. In many cases drawing such comparisons is difficult due to lack of data. This is why some researchers focus on survey results, even though these are only indicative of the subjective evaluation of science parks' impact.

Moreover, science parks cannot be analyzed disregarding the economic situation in the world, country or a region. A report by the International Association of Science Parks [8] points out that over 48 per cent of parks associated in this organization have been affected by the economic crisis. The companies that suffered most as a result of the crisis were tenant firms (54.3%) with park operators and supporting institutions being affected to a lesser extent, 25.7% and 20% respectively. Science and technology parks
operate inside economic systems of countries and regions and obviously cannot provide an instant solution to the systemic malaise of poor innovation. The same holds true for research communities: a park which relies on co-operation with a university or science institution is affected by regulations and mechanisms that rule the functioning of the academic environment at the national level. Lack of co-ordination in this area is bound to result in declining interest in and inefficiency of science parks.

A success story

When analyzing the relevance of actions that determine the effectiveness of science parks, besides general comparative analysis, it is useful to study the parks that have achieved success measurable with a range of criteria. Hsinchu Science Industrial Park in Taiwan is an example of spectacular success. Established in 1980, it not only became a commercial success but also significantly contributed to transforming the whole economic system of Taiwan. The history of initiatives undertaken in relation to the Hsinchu Park is an excellent example of best practices in setting up and managing such undertakings [9, 10]

In 1960s and 1970s, Taiwan had a relatively strong (despite its modest size) market position based on basic commodities. The Taiwanese government took a decision to implement a long-term strategy aimed at changing the economic profile of the country. One of the key initiatives was the establishing in 1973 of the Industrial Technology Research Institute (ITRI). The Institute is a research organization focused on developmental and applied research. Continuously subsidized and developed, the Institute played a key role in transforming the economy of Taiwan. As early as 1976 the Institute had begun work in preparation for semiconductor manufacturing, while the following year the first production facility was up and running. In the following years the Institute supported R&D work and startup companies involved mainly in the semiconductor, computer, telecommunications and optoelectronics industries. In 2011 the ITRI had 5,777 employees including 1,392 Ph. D-qualified researchers and operated its subsidiaries in the US, Japan, Russia and Holland [11]. The total number of patents held by the ITRI stood at 19,890; with 1,585 patents obtained in 2011 (more than four patents a day!). What is equally important, the Institute delivered 15,197 research services to business firms, out of which 74 per cent were delivered to the SME sector. In 639 cases successful commercialization and technology transfer occurred.

In their analysis [12], Lai and Shyu point to the intensive process of research personnel transfer from the Institute to business firms. Over the course of fourteen years,
since the Institute's foundation till 1997, over 7,500 staff members moved to the private sector, including 31.9 per cent to firms operating in the Hsinchu Park. 15.2 per cent of former ITRI's employees hold the highest level executive positions in these firms.

The success of the ITRI as a research and development centre has required and continues to require huge financial resources made available through consistent state policies. The ITRI's budget for 2011 is about 650 million dollars. Subsidies account for approximately half of the budget while the other half is revenues from R&D services contracted by business organizations. These very favourable proportions have been achieved as the result of the forty years of the Institute's operation and the impact of the HSIP Park's activity. It must be noted that initially the ITRI was exclusively financed from the state budget, on a scale much larger than what is the accepted practice in Poland. Equally importantly, the ITRI has always been the beneficiary of coherent long-term funding policies.

In 1980, based on the already existing ITRI and the universities of the National Chiao Tung University (currently ranking 45th 38th in the world's list of the best universities, in the categories of engineering and information sciences respectively) and the National Tsing Hua University (in general ranking between 226–250 in the world, and on the 67th position in engineering), the Government of Taiwan brought into being the Hsinchu Science Industrial Park. As history has shown, the co-operation benefited all sides involved. Although modeled on the parks operating in developed countries in accordance with the idea of bringing together research community and industry, the HSIP adopted a stricter approach to selecting firms eligible for the park's support. The HSIP management was obliged to verify whether candidate firms meet at least some of the following requirements [13]:

- A candidate firm should operate in an industry which has reached the maturity level at which product design, development and manufacture are possible; a detailed product development plan is available.
- The industry in which a candidate firm operates should have research and development potential.
- The projected direction of development requires substantial research work or supports the introduction of researchers to production processes.
- The industry in which a candidate firm operates should be adequately represented by the existing research institutions focused on innovation and technology research and development.

These criteria were applied in conjunction with the strategic selection of six industries in which tenant firms were to specialize: semiconductors, computers and
peripheral devices, optoelectronics, telecommunications, biotechnologies, and precision machinery. As will be demonstrated in the further part of this paper, not all of the above industries developed with similar results. In their work, Lee and Yang identified three stages in the development of the HSIP: the embryonic phase — till 1987, the profile development phase — till approx. 1992 and the growth phase which continues until now. In the first two phases the growth was rather slow: at the end of 1987, there were 77 tenant firms, employing 12,000 staff; in 1992 the number of firms rose to 140 and the employment level to 25,000. In 1999 there were already 292 firms employing almost 83,000 people. In 2012 the HSIP associated 514 firms employing over 150,000 people, while it is important to note that since 2000 several largest companies have left the park because they needed to look for a larger site (they continue to co-operate with park). The study conducted by Yan and Chen [14] presents the HSIP's financial results (and those of two other parks operating in Taiwan). The turnover of the HSIP-based firms currently amounts to some 40 billion dollars. But more importantly, the HSIP has affected the economy of the whole country. Despite covering a mere 0.1% of the country's territory, the technology parks account for about 16% of Taiwan's revenues generated by production, 40% of revenues generated by IT and 15% of patents obtained. Of vital importance is also added value created by the parks, including the indirect impacts. This added value was estimated, for the year 2006, in the semiconductors industry only, at 29 billion dollars (or 7.1% of the total GDP of Taiwan). Additional 15.8 billion dollars was added value generated in optoelectronics (3.9% of GDP). These figures clearly show that long-term, coherent and adequately financed policies of supporting technology parks have a huge impact on the economy.

The question that might be asked is whether tenant firms are in any way different to their counterparts located outside the parks? The answer seems to be yes, they are. For instance, turnover per employee generated by the HSIP-based firms is 2.5 times higher than the average in Taiwan. Yang, Motohashi and Chen [13] note that what distinguishes park-based companies is flexibility in managing R&D programmes and better investment management. This may result from the HSIP's policy of offering support and advice to tenant firms. Of importance might be also clustering opportunities offered by the park.

It's also worth asking whether everything the HSIP touches turns to gold. The answer is no — and not only with regard to individual firms (whose failures are only natural and to be expected), but also with regard to the strategic directions chosen by the government and the park. In his analysis Hu [10] demonstrated that precision mechanics and biotechnologies are clearly the weakest industries within the scope of
the park's activity. In view of this fact, the park's management decided to organize separate campuses for biotechnologies, taking into account both the administrative circumstances (filling the original park site) and the specific requirements of the industry. It is important to underline the foresight of the decision makers as the projected break-even point for this park subdivision is 15 years after its establishment. And this is with excellent management methods, cost optimization and experienced personnel. Return-on-Investment is even longer. We should bear this in mind when developing a strategy for supporting technology parks in our country.

Chen and Huang [15] studied the factors determining the HSIP's success with reference to particular industries within the scope of the park's activity. The factors analyzed included the level of technological support, the site accessibility, provision of adequate utilities (electricity, water, green technologies), relevance for the economy, government policies, technology maturity level and market potential. The last variable proved to be of the greatest significance, with the technology readiness level and governmental policies only slightly less important. It means that, provided it is managed well and has robust R&D activity, a technology park's success depends on its ability to adapt to a combination of market needs and technological possibilities (continuously changing!) as well as on the level of support received from the government and legislature.

To a certain extent, this dynamics is reflected in the EU's approach to research funding in the years 2014–2020, e.g. under the Framework Programme Horizon 2020 and the regional structural programmes. The key factor in the assessment of project financing will be project compatibility with smart specializations, which are tied to the regional economic policies and identified based on the technology readiness level, market needs and potential, chances for achieving the leading position in the market and, last but not least, needs of the community. Although the HSIP's success story tells us it is the right way to go, the relatively short planning period proposed by the European Union in spite of the strategic nature of the actions planned may be a cause for worry.

To conclude the present analysis of the HSIP as a model technology park, it would be useful to refer to the work by Lai and Shyu [12], who drew a comparison between the HSIP and an undertaking on a similar scale organized in China, the Zhangjiang High Tech Park near Shanghai (ZJHP). Both parks had similar resources at their disposal, including expertise and funding possibilities. The key differences which are determining a higher, as for now, effectiveness of the Hsinchu Park concern first and foremost more demanding local clients and the formation of clusters as opposed to
isolated enterprises. The latter factor is of vital importance for the success of the commercialization process as it ensures the uninterrupted product path from design to manufacture complete with a vision of the end-user.

Failure factors

Before proceeding to the detailed analysis of the factors that might contribute to the failure of a science park, it must be stressed that a failure of an individual firm (or even several firms) operating within the park is not the failure of the park itself. Risk is inherent to any business activity, in particular the business activity related to designing and bringing to market innovative solutions and products. Success rate estimation might be anywhere between 5 to 20%, depending on the market situation, industry, the firm's maturity etc. In reverse terms, between 80 to 95% of projects fail to bring expected results for a variety of reasons, both depending on project managers and those beyond their control. So there is something profoundly erroneous in a policy that requires a 100% success rate, typical of the Polish grant system supporting R&D projects and co-operation between science and industry.

In their paper questioning the effectiveness of the technology parks model, Quintas, Wield and Massey [16] criticize the highlighting of spectacular success stories of companies that grew out of the academic environment such as Hewlett Packard or Apple as the marketing rhetoric used by technology parks proponents. It is important to remember that using dazzling successes of the above mentioned companies to promote the idea of technology parks, in the context of typical market conditions and without stressing the risk of failure or sizes of firms characteristic for particular parks and technologies, is like advertising a lotto game by driving attention to a potential one-time million-dollar win.

Hence when analyzing the performance of technology parks it is necessary to consider general trends and the value of parks' contribution to the enhancement of entrepreneurship rather than successes or failures of individual firms located in the park or using services offered by the park. And these factors can only be measured from the long-term perspective and in comparison with the performance of firms that do not use any form of support equivalent to services offered by the parks. And so Bigliardi et al. [17], when analyzing the performance results of Italian technology parks, identified two groups of factors determining the success or failure of a technology park. The first category of factors, defining the park's real assumed mission, included the right context of the park's operations, interests of its founders and the expected time of return on
investment. The inability to coordinate, at a project planning stage, any of the above factors is bound to result in the failure of the whole enterprise. The second group of factors included on the one hand the legal form of the park and relevant constraints, and on the other hand the possibility to co-operate with top research institutes or universities.

From a Polish perspective it is interesting to look more closely at those countries which some time ago were at a similar stage of economic development to that of present-day Poland. Bakouros et al. [18] studied the status of science parks in Greece. The title of their work, Science Parks: A High-Tech Fantasy?, seems to be significant. The authors attribute the parks' lack of success to a number of factors including the scattered nature of their geographical distribution, the small scale, the recent creation, lack of long-term supporting policies and the ease with which new firms can join the parks. The reasons for relocating firms to science parks included: the prestigious location, transport facilities (including car parks), and administration services offered by the park. Access to research equipment and personnel came at the very end of the list. Likewise, Ratinho and Henriques write about “moderate contribution” of science parks to the economic growth [19]. The role of science parks in creating jobs is considered negligible, as are the financial results achieved by tenant companies.

Does it mean that less developed countries are doomed to failure? It is worth remembering that back in the 1970s Taiwan was a small and technologically undeveloped country. Perhaps its success was due to the determination of the Taiwanese government and its farsighted vision leading to undertaking adequate initiatives and formulating clear financing principles.

The authors of the work cited above[16] already over twenty years ago observed that it was unreasonable for central and eastern European countries to copy the model of technology parks functioning in the US or Great Britain while ignoring the economic context as it lead to making unrealistic assumptions about possibilities, needs, financing and expected results.

Obviously, some factors responsible for the failure of a given science park can be identified much earlier. For example when a park completely ignores best practices relevant to its business profile. In Poland, such situations were identified in the report prepared by the National Supreme Chamber of Control (NIK) [3]. An easier path — when parks only offer favourable (due to sponsorship) terms of office space lease is nowhere near delivering the objective of promoting innovation and supporting technological development. Out of 241 tenant companies controlled by the NIK, 22.4% ran business activities incompatible with the parks' objectives. Many incubators
(designed for startups) were home to companies that had operated for years. A mere 35% of tenant firms were technology-based companies, and even these often carried out business activities incompatible with a park's profile. In other words, companies were encouraged to join the parks for statistical purposes only. The examples cited in the NIK report sometimes verge on the comical when e.g. the Lublin Technology Park was home to a music theatre. Generally, the scope of support offered to tenant firms was limited to favourable lease terms and discounted business advice services (typically financed by the EU funds). A serious problem was lack of funding possibilities and no access to the investment capital — although this is a wider problem which cannot be wholly attributed to science parks' inefficiencies.

**Suggested measures to take**

The above analysis of the success and failure factors regarding science parks' operations in the context of the social and economic situation in Poland shows that it is necessary to reorganize science parks policies into coherent long-term programmes.

Effective commercial exploitation of research results requires building a chain of people and organizations who would serve the role of translators from the language of science into the language of business. Unfortunately, in Poland each side accuses the other of a complete lack of understanding of their respective needs and circumstances in which they operate. Given the emphasis placed by the EU on the commercialization of research outcomes in the upcoming financial period, finding a solution to this problem — which largely remains a communication issue — acquires a new urgency.

It is now fifteen years since Storey and Tether [2] observed that even though most EU countries are aware of the need for better co-operation between research community and industry, the communication process is in fact developing very slowly. Storey and Tether believe that the major reason for this situation is the attitude of resistance of science communities who perceive entrepreneurial needs as short-termed (not to say “short-sighted”), unrelated to genuine scientific discoveries and fundamental research and uninteresting. It seems that although Polish and European institutions responsible for funding science are putting an increasing pressure on the harmonious co-operation between research and industry communities and commercialization of research results, there is still much room for improvement in this area. The problem of mutual misunderstanding of science and business environments remains unresolved. Analyzing the operations of the Cracow Technology Park, Wach [20] draws attention to
'conservative attitudes among science circles' as a major factor in the decision-making process. On the other hand, it is the author's personal experience that entrepreneurs' focus on making quick profit at minimal risk effectively hampers co-operation prospects. Evidently, a lot needs to be done by both sides.

The focus on harmonizing the product design-to-manufacture path, including choosing the right strategic directions, securing the necessary level of funding for fundamental research and encouraging co-operation between industry and research communities, is a leading motif of both the new edition of the EU programmes (Horizon 2020) and national initiatives (Operational Programme Intelligent Development, National Smart Specialisation Strategy, National Research Programme). But without the right support tools easily accessible by researchers and enterprises, these programmes may never be realised. The role of such catalysts — according to the original concepts — can and should be fulfilled by science and technology parks.

However, for technology parks to function effectively, the right conditions must be created in the form of real (including financial) support for efforts related to promoting innovation and business activity. It is of vital importance that such support is not provided in the form of temporary investment projects but that it involves a continuous long-term financing programme, especially with regard to the technology domains and industries that are designated as drivers of the economic growth according to the National Smart Specialisation Strategy and the equivalent regional documents. If the programme to boost economic innovation is to bring expected results, it is necessary to rely on the best models available rather than agree to be confined by the existing attitudes.

The following efforts are likely to raise the efficiency of a comprehensive programme for supporting innovation and commercialization of scientific research outcomes, including through science and technology parks:

- Creating and supporting, at the governmental level, a long-term vision for smart specializations, dynamically modified in response to changing conditions but offering stakeholders (universities, research institutes, commercial partners) a sense of stable support (in contrast to incidental, reactive aid).
- Creating a programme for supporting and directing the operations of technology parks harmonized with the Smart Specialisation Strategy.
- Providing legislative and financial support for facilitating business-oriented research and development. Technology parks may function as one of the vehicles for this type of support. But establishing parks without providing relevant tax, legal and organizational regulations will not bring the expected results.
• Supporting and promoting, at the national and regional levels and with reference to universities and research institutes, the R&D focus of technology parks as the element linking academic and business environments. A strong focus on the delivery of statutory objectives of science parks, extending beyond inexpensive lease of office space. Promoting industry-dedicated efforts of universities and research institutes accomplished in collaboration with technology parks, for example within the national grant system.

• Ensuring continuity of financing for R+D+I projects, for instance through automatic qualification of near-completion projects for evaluation in the next round of financing (when achieving a higher TRL/MRL).

• Putting in place long-lasting financing schemes reflecting the real conditions of reaching financial balance so that park operators don't have to resort to offering the simplest services just to survive rather than focus on the high-cost efforts in the area of research and development.

• Extending the science and technology parks model to embrace production capabilities, so that parks could offer a complete product design to manufacture process.

• Tying the process and principles of financing R&D projects (e.g. by the NCBiR) to a comprehensive support strategy for science and technology parks.

• Developing and implementing best practices to coordinate park operations (specialization, complementariness, deduplication, consolidation).

• Moving away from indicators-based project assessment towards on-going monitoring of work outcomes and financial results. Acceptance of unavoidable risk of failure in this category of projects. Opening the possibility to correct and modify R&D projects, especially those spanning several years or longer. Promoting, as part of the comprehensive state-level policy, the activity of researchers functioning at the touch-point of science and industry, including in technology parks.

• Coordinating activities of individual ministries (e.g. Ministry of Science and Higher Education, Ministry of Regional Development, Ministry of Economy, Ministry of Finance etc.) concerning pro-innovative policies, including support for science and technology parks.

Undertaking such efforts is specially important in view of the latest European Innovation Scoreboard report [21], which shows that Poland is the only country to move down the innovation ranking (compared to 2011) from the status of Moderate Innovator to Modest Innovator, the lowest category in the ranking. A particular weakness of our
country is the link between business and public sector in the area of research (a mere
10% of the European average), new innovations (12% of the average) and
entrepreneurship. This situation can be changed — provided there is a will to act on the
part of all stakeholders: the government, academic circles and entrepreneurs, and
provided there are effective mechanisms in place (including legal regulations) envisaged
as part of a long-term strategy.

This work was co-financed from the European Regional Development Fund as part
of the Regional Operational Programme for the Mazowieckie Voievodship 2007-2013,
RPMA. 01.04.00-14-008/10.

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