Poznań Cluster of Science, Technology and Innovation

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Executive summary

Poznań City has a unique model of academic and business synergies. At the core of the model is the development of the Wielkopolska Centre for Advanced Technologies (WCAT) – a multidisciplinary center of high international ranking applying for status of European Centre of Excellence[2] focused on new materials and biomaterials which through its activity and industrial surroundings simultaneously constitute an important element of knowledge-based regional economy in Wielkopolska. The center is going to cooperate with Polish and International R&D centers, but of key importance for the transfer and commercialization of the new technologies is the short distance to the Poznań Science and Technology Park with the group of incubators for innovative spin-off firms. The incubators and the firms are the necessary link needed for the effective transfer of the technologies of new materials to technology-industrial parks and high-tech industry.

Introduction

The establishment of policies supporting the development of science, and technology, and even more importantly linking the policies to Poland's strategies and economic development, are the country's primary task in the creation of knowledge-based economy. The priority strategy concept adopted by the world's most developed countries was first formulated in 1987 in the famous document "OurCommonFuture", also known as the Brundtland Report, drawn up by the United Nations World Commission on Environment and Development. Essentially, it is a 21 st century challenge for the scientific community to devise its own strategy that would clearly outline the policy of research and technology encompassing integrated studies in the field of technology, ecology, economics and social science. The above-mentioned Report contains the first official mention of "sustainable development" to refer to the desirable model of civilization development defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".
Unfortunately, the European Union has been falling behind the USA and Japan in terms of the effectiveness of innovative policy, which has a major impact on innovative development. In 2000, the average level of funding for R&D activities across Europe was GDP (1.9%), whereas in the USA it reached 2.7%, in Japan 3.1 %, and in Poland just 0.6%. Aware of the discrepancy, in 2009 the European Union adopted the Lisbon Strategy with a view to making the EU, by 2010, the most competitive and dynamic knowledge-based economy in the world. The foundations of the strategy included innovation and an increase in R&D spending (both in the public and enterprise sectors) to 3%of GDP. Unfortunately, virtually nothing was done to implement the strategy and it has ended in a spectacular failure. There are concerns that the same fate might await the current growth strategy Europe 2020, which also comprises the target of investing 3% of GDP in research and development.

Scientific discoveries, which enjoy the highest esteem and prestige in the society, contribute to the creation of a new body of knowledge that is shared worldwide on non-commercial principles. However, the economic growth of individual countries is directly determined by development studies which are based on existing scientific knowledge resources, and innovations (i.e. dissemination of that knowledge) in the fields of science, technology and industry. Innovation does not belong solely to the domain of science. In fact, it should be treated as an important

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[2] Project „Teaming of Exellence" (Horizon 2020)

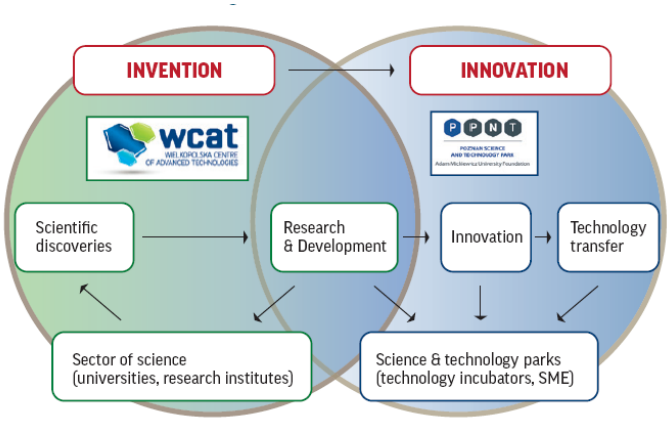
element of economic and social policies, principally because its central goal is to intensify the implementation of new technological and organizational solutions in the sphere of material production, utilization and services. Knowledge-based economy represents knowledge which ' has been translated into innovative solutions and advanced technologies. Its new dimension also involves a multidisciplinary character of novel ideas for the development of modern technologies.

The aim of this lecture is presenting a unique model for regional integration of science and technology and simultaneously its transfer to innovation firms realized mainly by Poznań Science and Technology Park- the oldest ST park in Poland.

From invention to innovation

Wielkopolska (Great Poland) is among the leading academic centers in Poland harbouring a great R&D potential. The essence of the comprehensive knowledge transfer model generated and pursued in the city of Poznań, the capital of Wielkopolska region is building an effective relationship between *invention*, pursued at universities and research institutes, and *innovation*, such as it is the case at the Poznań Science and Technology Park of Adam Mickiewicz University Foundation, by creating all elements necessary for the effective transfer of knowledge, especially Polish scientific and technological achievements, to business practice.[3]

At the core of the model is the development of the Wielkopolska Centre for Advanced Technologies (WCAT) in Poznań, a multi-disciplinary center of high international status focused on new materials and biomaterials of multiple applications and many other branches of industry and technology (see Scheme 1.).



Scheme 1. Poznań model of knowledge transfer

Clustering of Science and Technology in WCAT

The WCAT project is co-financed (85%) by the European Regional Development Fund under the Operational Programme Innovative Economy 2007-2013 with total budget of 63 million EURO. The construction of WCAT infrastructure (buildings) started in the fall of 2010 and the operational phase of the research centre is scheduled for the mid of 2014.

[3] Marciniec B., Polish Market 2012, 6, 26

Photo 1. Wielkopolska Centre for Advanced Technologies (WCAT)

WCAT brings together the best specialists of natural and engineering sciences and is an infrastructural venture of the Poznań scientific community. The Centre is a consortium of five universities: the Adam Mickiewicz University (AMU), which is the project coordinator, Poznań University of Technology, Poznań University of Life Sciences, Poznań University of Medical Sciences and Poznań University of Economics; four institutes of the Polish Academy of Sciences: the Institute of Bioorganic Chemistry, Plant Genetics, Human Genetics, and Molecular Physics; Institute of Natural Fibres and Medicinal Plants; and the Poznań Science and Technology Park of the Adam Mickiewicz University Foundation and City of Poznań. The project is based on the research know-how and credibility of leading scientists, working in the key institutes of the regions.

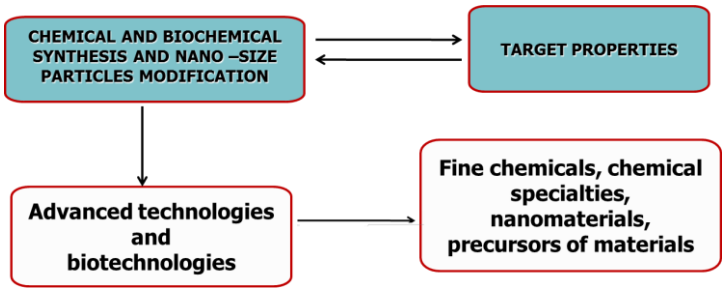
The vision of WCAT is to include existing organizations (universities, research institutes, and science - technology park) to act like one independent entity, which will generate synergies by combining the work of the best scientists. From mid-2014 , WCAT (after transfer of the assets from AMU) will be operating as an independent legal entity of Foundation (accordingly advised European Investment Bank engaged by European Commission in Jaspers initiative), as an independent R&D institute modelled on the Fraunhofer Society or VTT Research Centre of Finland-both most experienced of R&D Centres in Europe with 60-70 years tradition.

The commitment of the Fraunhofer Institute as a leading scientific institution (possessing unique know-how) to WCAT allows creation of a new Centre of Excellence within the Teaming of Excellence programme under Horizon 2020.

The mission of the centre is to create and realise large scientific and research projects, in cooperation with leading international research institutions, as well as to develop strategic programs coordinated and managed by the National Centre of Research and Development (NCRD). Last but not least, an important parts of this mission are internationally based research projects conducted in cooperation with European and worldwide industry, which is aimed at creating conditions for successful technological transfers.

The objective of the multidisciplinary activity of the centre is to develop original methods for synthesis of chemicals, biochemicals and agrochemicals, called fine chemicals, and a new generation of biomaterials and nanomaterials and their precursors, designed in cooperation between the chemists, physicochemists and biochemists. These research activity will be followed by the development of advanced technologies and biotechnologies for the production of these fine (bio)chemicals and precursors of materials to be used in optoelectronics, ceramics, medicine, pharmacy, agriculture and other fields of high-tech industry (see Scheme 2.).[4,5]

[4] Marciniec B., Poznań model of knowledge transfer (pol.), Chemik (Chemist) 2013, 67, 3
[5] Marciniec B. Ed., Mission of chemical sciences (pol.), Science and Innovation Publ. House



Scheme 2. General scheme of chemical and biochemical synthesis and nanostructuring materials precursors

Another objective of WCAT is to create a technological basis for a number of applications for bioorganic chemistry and biotechnology in healthcare (e.g. molecular and cellular therapies and medical diagnostics) as well as applications in agricultural engineering and in the food industry – (e.g. DNA tests in plant and animal production, biodegradable packaging and etc.).
The fine (bio)chemicals and hybrid (nano)materials produced will be thoroughly characterised and their properties (e.g. photochemical, mechanical, magnetic etc.) will be studied.
The planned scope of research is closely related to the strategic programme Horizon 2020 for technologies of new materials, designing new processes and industrial biotechnology.
It is worthy to emphasize that since 2007, most of the joint research projects based on the above program have been realized by scientists from the WCAT consortium members in interdisciplinary teams which are ready to continue the research work in the operation phase of the project, i.e. since September, 1 2014 as the independent legal entity (Foundation) - Wielkopolska Centre for Advanced Technologies.

Such an integration of the scientific community of Wielkopolska region offers a chance for creating a research and technology centre of high international standing (the European Centre) combining the best experts in natural and technical sciences who would work on design and development of unique (nano)materials and biomaterials of wide use. WCAT will offer jobs to over 200 research workers as well as 400 PhD and MD students recruited mainly from universities and institutes seated in Poznań. There will also be jobs for experts from other European countries.

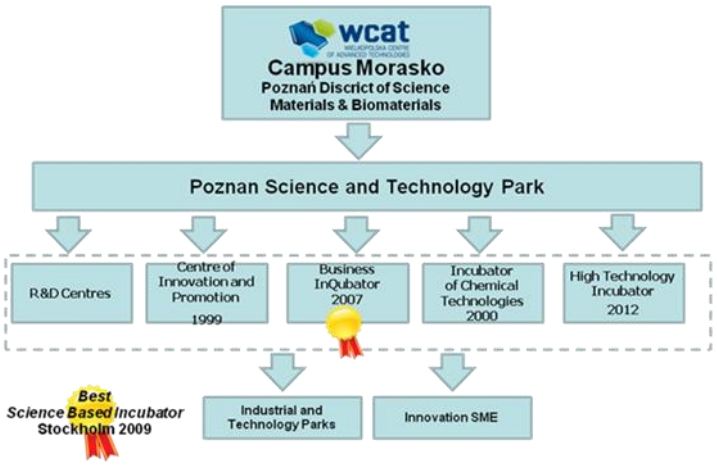
The activity of WCAT fits perfectly into smart specialization strategies, developed for the Wielkopolska region and will be a strong element of support for:
- the economical regional specializations defined as industrial processing, agriculture and material sciences,
- science regional specializations defined as the biotechnology and materials sciences.

To reach the complex goals mentioned above, the consortium members pledge to ensure permanent cooperation between all units of WCAT i.e. Centre of Chemical Technology and Nanotechnology, Centre of Plant and Industrial Biotechnology with a Greenhouse, Centre of Medical Biotechnology with an Animal House, Centre of Material Sciences with a Regional Laboratory of Unique Equipment, functioning as one research organism (see Photo 1.). As emphasized, the Regional Laboratory of Unique Equipment should be of service to all other units of WCAT.
The Laboratory has highly specialized equipment which will be available for use by the scientific community and small and medium enterprises from the region as well as R&D centres of Polish and international (European) companies. The Service and Technical Facilities with the Technology Transfer Centre will ensure efficient collaboration among all parts of WCAT.

In terms of international cooperation with foreign R&D partners, the members of WCAT have already started cooperation within well recognized initiatives, such as RAMIRI (Realizing and Managing International Research Infrastructures) and RAMIRI2 projects, coordinated by Imperial College London and Elettra Synchrotrone Trieste. This cooperation will lead to a strong position of the Regional Laboratory of Unique Equipment as a part of the European Road Map of R&D infrastructures.

The position of Poznan Science and Technology Park in the flow of knowledge and technology to practice

WCAT will cooperate with the research and development centres of Polish and European corporations and the Poznań Science and Technology Park of Adam Mickiewicz University Foundation (PSTP), the oldest Park in Poland with its departments presented below plays the key role in the transfer of technologies and their commercialization. The Park, with R&D and Innovation and Promotion Centres as well as group of business and technology incubators for innovative spin-offs and start ups, constitutes the necessary link needed for the efficient transfer of new materials technologies to practice, especially to industrial parks and high-tech industry. A well organized science and technology park, having close links to the science sector, is the most effective means of paving the way for knowledge-based economy.



Scheme 3. Model for Cooperation of WCAT with PSTP

The Poznań Science and Technology Park (PSTP) of the Adam Mickiewicz University Foundation has created a unique environment for cooperation between the scientific and business communities (Scheme 3.). PSTP made a very unique proposition for academic researchers which is the ability to create R&D centers within the park. Their activity is based on an agreement between the university and the park. These projects supported with PSTP offer to the market research and development services conducted by experts from universities, using research facilities of the park or university.
It is a simple way that the researchers could use their knowledge and experience not only for scientific purposes, but also to support the business. This does not require the participation of the university, on the other hand, does not require the company. Examples are:

- Advanced Chemical Technology Center offering design and facilitate the existing technologies of the synthesis of chemical compounds and solving synthetic, technological and analytical problems for different companies from a chemical sector.
- Waste Management Center "Waste Park" – offering complex consulting services related to environmental preservation
- Poznań Radiocarbon Laboratory – carrying out ^{14}C tests with the most modern accelerator technique (AMS).
- The Center for Optics and Optometry – offering optical and optometric measurements and trainings

In the past decade, the Park's Innovation Support Centre and then its InQbator have developed comprehensive services to support entrepreneurship among students and residents of the city, and to support businesses: both those operating in the Park and throughout the region of Wielkopolska. Of special significance is the support for the development of relations between universities and businesses that is the transfer of innovation and technologies at the national and European levels. The Technology InQbator, set up in 2006 as part of the Park, has worked out efficient tools for cooperation with the academic community. Thanks to numerous training courses a host of young entrepreneurs have acquired skills needed to run their own

businesses. The courses were both virtual and traditional, including Virtual lnQbator, Summer School of Enterprise, TechnolnQbation of Ideas and First Step in Your Business. The lnQbator Seed is a recent undertaking intended for those who conduct research in the field of chemistry, biotechnology and IT, have an idea and unique know-how. As part of the project, it offers a service which makes it possible to receive up to PLN 600,000 in financial aid and help from experts in order to support original and modern undertakings.

The Chemical Technology Incubator has the infrastructure required for conducting processes on a large laboratory scale and quarter- industrial scale. It equipment which enables performing both basic and specialist physicochemical and analytical tests.

Photo 2. Centre for Advanced Chemical Technology in PSTP – Chemical Technology Incubator

The biggest initiative of PSTP is the implementation of the Complex of High Technology Incubators (HTI), i.e. is the largest laboratory complex in Poznań intended primarily for the spin-offs that deal with materials and biomaterials as well as information and communication technologies project under the Innovative Economy Operation Program of EU.It's a place with suitable conditions for simplifying the creation, transfer and diffusion of modern solutions for entrepreneurs. Thanks to modern infrastructure, innovative companies have the opportunity to experience the support in the form of research, business-related and infrastructure services coordinated by PSTP. As the result the number of spin-off companies is supposed to increase together with the number of patents and new technology solutions generated on the area of PSTP. Apart from modern infrastructure, our business tenants gain access to a package of pro-innovation and business services designed to support their expansion. These include advisory services, training, workshops, promotion, technological audit and assistance in acquiring funding from EU research projects.

Photo 3. Complex of High Technology Incubator

The PSTP offers comprehensive solutions to companies building their strong ties to academia. With a strong support and funding coming from the Polish government agencies as well as the Ministry of Higher Education the institution provides tools to manage companies growth and innovation implementation. The most important in building the Poznan science, technology and innovation cluster is to bring together its players. This is what the PSTP does. It brings together companies and academic players to enhance the economic impact on society, academia and the companies themselves. The PSTP helps companies reach out to science by providing technology transfer tools, such as direct meetings, technology scouting, technology audits and so forth. The companies as well as the academic institutions may – thanks to the PSTP international ties – reach out to foreign markets and international scientists. By working on various projects the PSTP may match international players, provide international expert support and prepare the companies to international expansion. On the other hand, having tools such as project supporting scientists, the PSTP may provide support in finding human capital necessary to enhance research and development of local institutions and market players. Such a revolutionary approach guarantees the synergy effect and builds the science park position of one of a kind supporter of economic growth based on research outcome.
The PSTP also promotes a unique model of support for academia in delivering their research outcomes to the economy. As a regional unit, the Park provides advisory services as well as some funding for technology prototyping and adjusting the research outcomes to the market needs. The services are delivered to various academic institutions in the region. By matching academic institutions, and more specifically – research teams working on certain solutions – with market players, the PSTP makes the technology transfer real. It results in implementation of real academic technologies in real businesses, which furthermore gives overall economic growth and increases the local enterprise's competitiveness. Again, the Park builds the cluster of innovation and technology by cross matching teams from various academic institutions and enterprises. In many cases the enterprises are start up companies that are being formed by the academic faculty or students. The PSTP provides advisory services to such companies as well, helping them develop and implement technologies in accordance with the intellectual property law and rules.

Science – Business Cooperation in PSTP

Turning ideas into business reality for almost 20 years, the Poznań Science and Technology Park (PSTP) has actively worked to facilitate the process of commercialization of knowledge and to support the development of innovative companies, including spin-offs. An important element in creating the Poznań model for the transfer and commercialization of knowledge is the city's centuries-long tradition of private enterprise and small business, and the 90-year history of Poznań International Fairs, which have been a genuine forum, in different political periods, for international trade and a place where one could get familiar with the European model for relationship among science, innovation and business.

There are very different stories of innovative start ups in PSTP. Some of companies started as PSTP research centers leaded by university researchers. After some period of operation the research center turns into a successful spin out company obviously present in PSTP as tenants. In another model of start ups formation, entrepreneurial scientist created spin out companies based on knowledge and technology their created during their scientific career. One of them (Future Synthesis) is a technologically advanced biotechnology company specializing in the synthesis of nucleic acid fragments of DNA / RNA molecular probes containing fluorescent labels and other useful modification of nucleic acids useful in biotechnological research. They also carry out chemical synthesis of other requested bio-molecules. The other spin-off (AdvaChemLab) is an innovative chemical company working on the development of technology to receive highly specialized chemicals (fine chemicals) for the pharmaceutical industry. Another example of chemical spin-off has been created to sale own organosilicon compounds based on the unique solutions developed at the Adam Mickiewicz University in Poznań (Innosil). Of international R&D centers is it necessary to mention European R&D Laboratory of American Company W.R.Grace working on development of new innovative technologies in the field of concrete additives, cement admixture and waterproofing.

The latest model of science – business cooperation presented in PSTP is Waste Cluster which brings together companies interested and working in the field of waste management technologies and non-

waste technology. It offers comprehensive solutions in the field of waste management, laboratory analysis, environmental monitoring, research and commercialization of research results.

To provide the comprehensiveness, high quality of services and internationalization to all parties participating in the presented unique cluster system in the Park – as a substantial player translating science to business – maintains international partnerships with counterparts all over the world. One of the examples is a Memorandum of Understanding signed with the University Technology Park of the Illinois Institute of Technology at Chicago, USA. This partnership allows for knowledge and experience exchange between the Parks stakeholders, but what is more important it gives mutual exposure to international scientists, capital and markets for all institutions and businesses involved in activities of both systems: PSTP-WCATT in Poland and UTP-IIT in the United States. The PSTP has been created based on American model of science-technology parks and still maintains that unique and comprehensive approach providing complex services for both the scientists and entrepreneurs. From the research perspective the partnership with the US Park allows for scientists exchange and academic collaboration. Thanks to the signed partnership both: American and Polish businesses may benefit from an easy access to new markets, office and lab space. It gives a tremendous potential for business expansion to companies in both cluster system.

Prior to their physical presence and expansion it is possible to provide market reports to companies willing to invest in a partnering country. With a use of business professionals and experts both Parks provide preliminary market study and reports that will ease the investment decision of their clients as well as will reduce their risk in undertaking expansion to international markets.

Another partnership agreement has been signed with the WISTA Science and Technology Park in Berlin-Adlershof. Again a large scope of activities and comprehensiveness of both Parks provide services and internationalization opportunities to both Polish and German scientists and entrepreneurs.

Regional Cluster for Advanced Technologies

The Park is located several kilometers from the Adam Mickiewicz University campus in the city 's district of Morasko which is called the Poznań Science District and where the WCAT is located. The proximity is very important for the transfer of technologies to innovative businesses based in the-Park. This showcase institutional solution to the relationship between invention and innovation offers a great chance for keeping in Poznań, and in Poland, the most talented and skilled young people who pursue their ambitions in science and high-tech business. The integrated approach is consistent with the dose cooperation paradigm which has existed fora long time now and which is rooted in the concept of creation of a competitive pole of development which takes the form of the regional Cluster of Advanced Technologies.

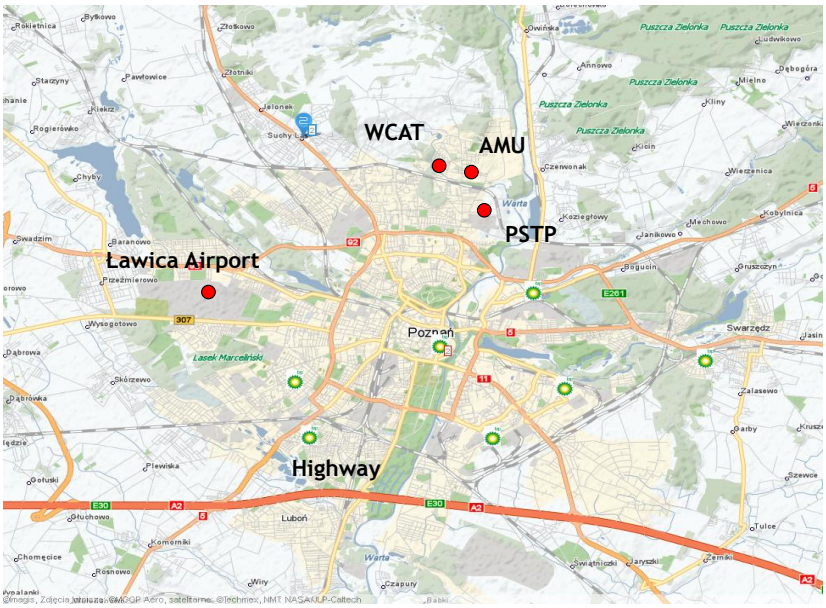
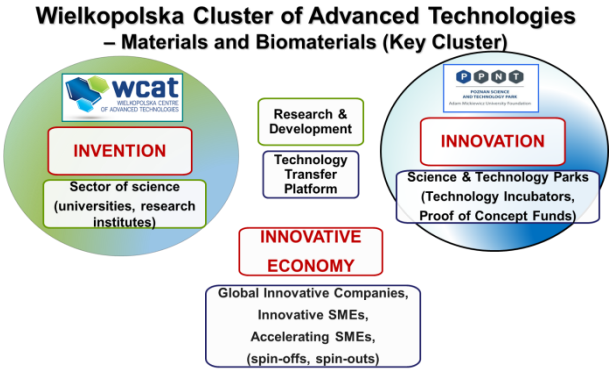


Photo 4. Map of Poznań



Scheme 4. Wielkopolska Cluster of Advanced Technologies - Materials and Biomaterials

Conclusions

- The comprehensive model of knowledge transfer being pursued in Poznań is designed to build an effective relationship between *invention* (at universities and research institutes but not only WCAT consortium) and *innovation* (in the Poznań Science and Technology Park run by the Adam Mickiewicz University Foundation and other industrial and technological Parks and innovative SME as well as by international industry) by putting in place all the necessary elements indispensable for an effective transfer of knowledge, in particular the transfer of Polish scientific and technological achievements to business practice.

- Whole clustering system proves its comprehensiveness and care towards its stakeholders; including tenants, academic institutions, business support institutions, local government and others. By providing such vest services and potential of the Poznań Model of Science Technology and Innovation Clustering with its cluster system plays a very important role in economic development of the region but also serves as one of the strongest scientific centers in the country; delivering high level transformation via innovation, inventions, investments and jobs to the community and society.

- This showcase institutional solution to the relationship between invention and innovation offers a great chance of keeping in Poland and in Poznań the most outstanding young people, those who pursue their ambitions in science and high-tech business. It seems that the “science of the future” designed in this way has finally got its big chance to pursue its mission at a world-class level on the basis of the latest technologies in disciplines which are of key importance for the sustainable development of the region and Poland.