

Agencja Rozwoju Aglomeracji Wrocławskiej

# Research and development potential in the Wroclaw



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## Research and development potential in the Wroclaw agglomeration

2024

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### Foreword

Ladies and Gentlemen,

on behalf of the Wroclaw Agglomeration Development Agency (ARAW) and the Antal company, we are honoured to present you with a report which analyses the research and development (R&D) sector in Wroclaw in a detailed and comprehensive way. Our study which encompassed 403 businesses conducting research and development operations provides data confirming that Wroclaw is one of the key innovation centres in Poland and Europe.

Wroclaw has been attracting the attention of investors from the new technologies sector for years, becoming one of the most important R&D centres in Poland.

The fact that the city is home to a large share of research and development centres in Poland is particularly impressive – this is reflected in the growing number of businesses deciding to locate their R&D departments in this very place. In 2019-2022, the number of entities conducting research and development activities in Wroclaw increased by 34%, which constitutes evidence of the exceptional dynamics of this sector in the region.

The report that you have before you is based on a wide range of data, which makes it a reliable source of knowledge. The analysis we have conducted indicates that expenditure on the R&D activity in the Lower Silesian (Dolnośląskie) region reached the impressive amount of PLN 3.9 billion in 2022, placing Wroclaw in the lead of the most dynamically developing centres in Poland, immediately behind Mazovia (Mazowsze) and Lesser Poland (Małopolska).

Wroclaw also stands out in terms of specialisation in various areas of the R&D activity. Our study showed that the dominant sectors here are engineering and manufacturing (51% of businesses), information and communication technologies (37%), as well as chemicals and materials (16%). Such diversity in the sector supports the creation of innovative technological solutions which have a chance of influencing not just local but global development.

The results of our study indicate moreover the high financial investment of businesses in research and development activity – as many as 20% of them have been allocating over 30% of their annual budget to this goal. This shows how seriously Wroclaw enterprises treat their Foreword

investments in innovations, which translates into their competitiveness in international markets.

Wroclaw is a city which not only has potential but realises it effectively. We believe that this report not only provides you with key information but also inspires you to invest further in the R&D sector, contributing to increased innovativeness and competitiveness of Wroclaw on the international arena.

Respectfully,



dr Magdalena Okulowska PRESIDENT OF THE MANAGEMENT BOARD, WROCLAW AGGLOMERATION DEVELOPMENT AGENCY



Artur Skiba CEO OF ANTAL



# Key conclusions from the report

## High concentration of the R&D firms

## Dynamic growth of the R&D sector

#### Diversification of the R&D activity areas

#### **Innovative startups**

11% of Polish enterprises with the research and development centre status awarded by the Ministry of Development and Technology are based in Wroclaw. These include Centrum Badawczo-Rozwojowe "NOVASOME" ("NOVASOME" Research and Development Centre) and Dolnośląskie Centrum Innowacji (Lower Silesian Innovation Centre). At the same time, 663 entities have been conducting R&D activity in Lower Silesia in 2022, and among them such firms as: Codelab R&D Site, Viessmann laboratory and Nordes R&D.

In 2019–2022, the research and development sector in Lower Silesia underwent dynamic growth, which manifests among other things in the 34-percent increase in the number of entities conducting research and development activity. At the same time, outlays on research and development activity in the region amounted to PLN 3.9 billion, placing the region in the third place among voivodships, immediately behind Mazovia (PLN 15.7 billion) and Lesse Poland (PLN 6.3 billion). Internal expenditure on research and development activity in the Lower Silesian voivodship increased nearly four-fold in the years 2014–2022, which indicates the intensification of investments in innovations and technological development in this region.

Businesses in Wroclaw conduct R&D activity in a broad spectrum of areas, such as engineering and manufacturing, information technologies, chemicals and materials, energy generation and medicine. This diversification contributes to the creation of innovative solutions in different sectors.

Wroclaw is the leader in Poland in terms of the number of startups – 28% of all Polish startups are registered in Lower Silesia, of which a great majority in Wroclaw. The dynamic development of the startup sector is supported by numerous incubators and acceleration programmes.

## Significant role of universities

## High rating for the educational potential

#### New opportunities for businesses and universities

## High qualifications of personnel

30 universities operate in Wroclaw and educate over 105,000 students of whom over 42,000 in fields of study that are key for R&D. The cooperation between universities and business is well-developed, which contributes to the dynamic development of innovations.

64% of firms rate the educational potential of Wroclaw universities in the context of the R&D cooperation as good or very good. Students have access to numerous internship and training programmes in companies such as Selena, Mikroel, LG Energy Solution Wroclaw, Hasco--Lek, which promotes the development of practical skills.

Despite the fact that 21% of firms in Lower Silesia have not undertaken cooperation with universities as yet, the remaining 79% of enterprises have been actively benefitting from opportunities offered by the university-business partnership. The research conducted by ARAW and Antal indicate that 58% of firms are involved in offering internships and training, and 37% carry out shared research projects. This shows the growing potential for further tightening of cooperation, which may contribute to even further development of innovations and technologies in the region.

60% of firms rate the availability of qualified specialists in the R&D area as good or very good. The high level of education, creativity and innovation, as well as knowledge of modern technologies are the main strengths of Wroclaw human resources.

## Strong connections with industry

More than half of firms from the industrial sector have been cooperating with local universities, implementing shared research projects, offering internship and training, and becoming involved in consulting activity. This cooperation is of key importance for the development of modern technologies and innovations.



PART 1

# What is R&D?

### 1.1. The importance and role of the R&D department

The term R&D (Research and Development) describes scientific research and development work. It is conducted in various enterprises and sectors: from pharmaceuticals, to production of clothes, to marketing. In some sectors, e.g. IT, it seems necessary – the rate of changes and the progressing development of technologies is so high here that without the introduction of innovations businesses quickly lose their competitiveness.

R&D activity is not restricted to laboratories or research processes. Its impact is felt in every aspect of operation of an enterprise. Under these activities, a team of specialists, such as programmers, engineers, persons in positions connected with researching needs, marketing, etc. (in each firm depending on the sector in which it operates it may be a different composition and required competences), deals with conducting research, develops technologies which result in the creation of concepts of new products and services. The aim of these activities is to increase the competitiveness of the business in the market.

The specific nature of operation of the R&D departments differs depending on the sector or even the business, however the basic processes are usually similar. Key tasks of research and development reams include: creating concepts of new products and developing methods of their manufacture in accordance with the company's business goals. In some cases these are completely innovative solutions, in other – connected with the improvement of the already existing offer.

Usually, projects begin with market research, testing the available technologies in terms of their possible application to the assumed goals, and creating reports which constitute the basis for further activities. The development process ordinarily lasts several months. Its length may differ depending on the type of project or degree of difficulties encountered. Before a product makes it to the market in a fully mature version, it must go through a number of tests in its target environment. The solution is verified in particular in terms of its functionality and safety. The progress of the research and development process and the subsequent implementation is usually of structured nature with clearly demarcated stages. At least, this is what it looks like in companies with well-developed R&D departments.

#### Specific nature of the R&D area

The size of the firm clearly affects the scale and complexity of its activity in the research and development department. The important thing is also the company's specialisation. In large international corporations, research and development work is usually more complex and requires higher capital expenditure, but also provides greater opportunities for developing innovative products and their distribution. In the case where highly technologically advanced products are manufactured, e.g. in the semiconductor or pharmaceutical industry, the costs of an investment in a research and development centre may run into billions of dollars.

Smaller businesses in turn have the advantage of greater creativity and faster decision making. Teams working in such companies often have more freedom in selecting directions of their research.

Gross domestic expenditures on research and development activity in 2022 amounted to PLN 44.7 billion and had grown in relation to the previous year by 18.6%.

The R&D work intensity ratio which constitutes the share of internal expenditure on R&D activity in GDP amounted to 1.46% (in 2021 – 1.43%). The value of gross domestic expenditures on R&D activity per capita was PLN 1,182 and was greater by 19.2% than in the previous year. The number

1 Source of data: Statistics Poland, Działalność badawcza i rozwojowa w Polsce w 2022 r. (Research and development activity in Poland in 2022).

2 Ibidem.

of entities involved in R&D activity increased in comparison with the previous year by 0.8%<sup>1</sup>.

The executive sector characterised by the highest internal expenditure on R&D activity was the sector of enterprises which in 2022 spent PLN 29.5 billion for this purpose (an increase of 23.9% in relation to the previous year). The share of expenditures of this sector in the gross domestic expenditures on research and development activity was 65.9% (compared to 63.1% in 2021). In other executive sectors these shares were: 32.0% – higher education sector, 1.9% – government sector, and 0.2% – private non-commercial institutions (compared to, respectively, 34.7%, 2.0% and 0.2% in 2021)<sup>2</sup>.



PART 2

## R&D review in Wroclaw

# 2.1. Percentage share and structure of business-adjacent R&D

Number of entities conducting R&D activity over the years 2019–2022 grew by 34%, reaching 663 entities in 2022<sup>3</sup>

Employment in the R&D centres in Wroclaw in the service sector<sup>4</sup>:

Internal expenditures on R&D activity in the Lower Silesian voivodship in 2022<sup>5</sup>:

Entities in the R&D business in the Lower Silesian voivodship in 2022<sup>6</sup>:

Based on the data from Statistics Poland (GUS),

internal expenditures on research and deve-

lopment activity in the Lower Silesian voivod-

ship in the years 2014-2022 increased nearly

four-fold. More than half of the funds is allo-

cated on engineering and technical sciences,

and 29% - on natural sciences. In the sector

Number of people employed in R&D in the Lower Silesian voivodship in 2022<sup>7</sup>:

of enterprises, when broken down by types of activity, information and communication have the largest share in internal expenditures (60%), followed by manufacture of motor vehicles, trailers and semitrailers, except motorcycles (13%), and manufacture of machinery and equipment, not elsewhere classified (9%).

**13 000 persons** 

PLN 3.9 bilion

663

15 483

18

<sup>3</sup> Statistics Poland, Local Data Bank.

<sup>4</sup> ABSL, SECTOR OF MODERN BUSINESS SERVICES IN POLAND 2024.

<sup>5</sup> Statistics Poland, Local Data Bank.

<sup>6</sup> Statistics Poland, Local Data Bank.

<sup>7</sup> Statistics Poland, Local Data Bank.

#### CHART 1.

Internal expenditures on R&D activity in the Lower Silesian voivodship in the years 2014–2022 [PLN billion]<sup>8</sup>



#### CHART 2.

Structure of expenditure on research and development activity in Lower Silesia in 2022, broken down by fields of science<sup>9</sup>



<sup>8</sup> Statistics Poland, Local Data Bank.

<sup>9</sup> Statistics Poland, Local Data Bank.

#### CHART 3.

### Internal expenditures on R&D activity in the enterprise sector by types of activity to which R&D work was dedicated in $2022^{10}$



Due to its favourable location in terms of geography and transport – near the border with Germany and Czechia – Lower Silesian voivodship supports the development of innovative sectors of industry.

Wroclaw is home to 11% of Polish enterprises who have received the status of a research and development centre from the minister. They constitute technical and scientific support for specific industries and specialties, such as e.g. pharmacy, medicine, energy sector, manufacture of mining machinery, or information and engineering sector.

Under the survey conducted by ARAW and Antal, 403 firms conducting research and development activity were asked how many people in their organisations was involved in Rand what the main areas of activity in their businesses were. The analysis of data concerning the number of people involved in R&D activity shows that firms with fewer than 6 employees in the R&D department constitute 15%. Another 10% of firms employ between 6 and 10 persons, and 14% has teams of 11 to 25 persons. Larger teams of 26 to 50 can be found in 16% of businesses, whereas 12% of organisations employ 51 to 100 employees in research and development departments. The largest firms, with teams exceeding 100 persons, constitute 29% of the respondents

<sup>10</sup> Statistics Poland, Local Data Bank.



#### CHART 4. Number of persons in firms in the Wroclaw agglomeration in R&D activity

Source: Surveys by ARAW and Antal, 2024

As regards main areas of R&D activity, engineering and manufacturing dominate with 51% of responses. Information and communication technologies take the second place with the 37% share. Chemicals and materials are represented by 16% of firms, and energy sector, transport and logistics, as well as sustainable development and ecology were indicated by 9% of firms. The share of medicine and pharmacy accounts for 8%, and biotechnologies – 7%.

#### CHART 5.

#### Main areas of R&D activity in Wroclaw firms



Other areas, encompassing mainly such industries as mining, space technologies, have been indicated by 10% of businesses surveyed.

Data presented in the table below throw some light on how different companies allocate their annual budget to the research and development activity. When analysing the available categories, one might notice that the largest group of respondents (45%) is not certain or has no data about how large percent of their budget is allocated to R&D, which suggests lack of transparency or difficulties in following expenditures on research and development in their organisations.

Among firms which provided specific values, 20% invest more than 30% of their annual budget in R&D. This is a significant investment which may indicate strong involvement in innovations and technological development. In turn, 13% of businesses allocate less than 6% of their budget to this purpose. In mid-range, 10% firms invest between 6% and 10% of their budgets in R&D, and 8% of firms allocate between 11% and 20% for this purpose. These values indicate moderate involvement in the research and development activity. The smallest group, 4% of firms, invest between 21% and 30% of their budget in R&D, which may also be an indication that innovations constitute a significant but not a top priority in those companies.

The results of the survey conducted make it possible to indicate the differentiation both as regards the scale of employees' involvement in R&D activity, and in main research areas, which reflects the broad spectrum of research and development activity in different sectors of industry. On the basis of data, we can show the diversity of approaches to investing in R&D, where a significant proportion of firms either are not clear about their expenditure, or invest significant funds in the development of new technologies and products. This diversity in financial commitment shows how dynamically R&D investment strategies are developing, which is of key importance for competitiveness and innovativeness of businesses in the market.



#### CHART 6. Percentage of the firm's annual budget allocated to R&D activity

Source: Surveys by ARAW and Antal, 2024



# 11

Research and development centres play the key role in Lower Silesia's economic development, combining research and business and supporting technology transfer.

Grzegorz Wołodko

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## Expert commentary

#### Grzegorz Wołodko

Vice President, Head of GDC Application Business Line, Capgemini Polska

Investments in research and development (R&D) constitute they key driver of Lower Silesian economy, impacting its development on many levels. In the short term, they attract talented employees from outside the region, simultaneously offering graduates of local universities unique professional development opportunities. This to this, Lower Silesia is becoming the centre of innovation, which raises its attractiveness both for young talents and experienced specialists.

In the medium term, investments in R&D make it possible for Lower Silesia to compete on the international arena through innovations and expertise, not just price.

This approach favours economic development of the region and contributes to the region's economic growth, which creates a snowball effect and attracts further investments.

In the long term, intensive investment of capital in R&D may create an innovative ecosystem in Lower Silesia. It will support not just the largest local investments but will also improve innovativeness and competitiveness of firms and startups in the entire region. Businesses cooperating with research and development centres will be able to implement modern technologies more quickly, thus reinforcing their market position.

Research and development centres play the key role in Lower Silesia's economic development, combining research and business and supporting technology transfer. Capgemini, as a leader in providing technological services, actively participates in the shaping of this ecosystem. The Wroclaw branch, benefitting from local resources and global know-how, supports the development of innovative projects, strengthening the region's economy and the position of Lower Silesia on the map of European R&D centres.

### Research and development centres (RDC)<sup>11</sup>

The status of a research and development centre, pursuant to the Act of 30 May 2008 on certain forms of supporting innovative activity (Journal of Laws 2022 item 2474) is granted by the minister competent for economy, at the request of an entrepreneur who meets formal criteria. The minister competent for economy grants the RDC status to the entrepreneur, and not to the separate unit within the structure of the enterprise.

An entrepreneur conducting research or development work (excluding the research institute, Łukasiewicz Centre and the institute operating within the Łukasiewicz Research Network) may obtain the research and development centre status after meeting the criteria specified in Art. 17 of the Act of 30 May 2008 on certain forms of supporting innovative activity (Journal of Laws 2022 item 2474).

## Firms in Wroclaw and the surrounding area with the status of a research and development centre<sup>12</sup>:

#### "NOVASOME" RESEARCH AND DEVELOPMENT CENTRE (CENTRUM BADAWCZO-ROZWOJOWE "NOVASOME")

"Novasome" Research and Development Centre was established in Wroclaw in 2004, and its main area of activity encompasses work in the field of medical sciences, pharmacy and cosmetology. The Centre conducts research based on the knowledge and development of the latest technologies, provides expert and analytical services. It invests in novel, innovative activities through regular cooperation with pharmaceutical companies and universities, such as University of Wroclaw, Wroclaw University of Science and Technology, or Medical University in Wroclaw. Since 2014, Novasome ranks among an elite group of entities that have been awarded the status of a research and development centre by the minister of economy. This status makes it easier for its holder to innovate and commercialise inventions.

The company is a specialist in the professional implementation of research projects, from the concept and market opportunity analysis phase to the development phase, and finally to the transfer of methods from the laboratory to industrial production. It offers the development of the complete analytical and technological documentation necessary for the registration of the medicinal product, dietary supplement, or cosmetic. Pharmaceutical products developed by the qualified personnel of Novasome are available in the market, and part of them are patent-protected. Work on further products which are successively marketed continues ceaselessly.

#### LOWER SILESIA INNOVATION CENTRE (DOLNOŚLĄSKIE CENTRUM INNOWACJI (DCI)

DCI (Lower Silesian Innovation Centre) is a university special purpose vehicle established by the Higher School of Sports (formerly Higher School of Management and Coaching in Wroclaw). DCI was established for the purpose of indirect commercialisation, which consists in subscribing for or purchasing shares or stocks in companies, as well as taking up subscription warrants entitling the holder to subscribe for or take up shares in companies. These activities are aimed at implementing the results of research activity and know-how related to those results or preparing for their implementation. More-

<sup>11</sup> The information below has been developed based on: https://www.gov.pl/web/rozwoj-technologia/centrabadawczo-rozwojowe.

<sup>12</sup> https://www.gov.pl/web/rozwoj-technologia/wykaz-cbr.

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over, DCI conducts activities aimed at better utilisation of the intellectual and technological potential of the university, including transfer of results of research work, development work or know-how in the form of sales or free transfer, handing over for use, e.g. pursuant to a licence, rental or lease agreement.

DCI carries out tasks connected with the university technology transfer and research and development work, as well as activities to disseminate knowledge. The basic objective of DCI is to independently conduct basic research, industrial experimental development work, and to disseminate its results.

#### ENERGY SYSTEMS AUTOMATION INSTITUTE (INSTYTUT AUTOMATYKI SYSTEMÓW ENERGETYCZNYCH)

Since 1949 the Institute has been specialising in the automation of technological processes and control centres of energy and industrial facilities. The Institute is the contractor carrying out specialist work in the field of automation and control of industrial processes, as well as the supplier of automation systems and equipment, as well as specialist program tools. The company conducts research and development activity, having its own science and research base as well as a research and calibration laboratory. Having the status of a research and development centre, the Institute conducts research, analyses and implementations of specialist, innovative solutions.

#### KGHM CUPRUM RESEARCH AND DEVELOPMENT CENTRE (KGHM CUPRUM CENTRUM BADAWCZO-ROZWOJOWE)

The main activity of the Centre is conducting applied and industrial research in the field of mechanics, automation, and machinery construction, first and foremost in the area of handling and maintenance. Moreover, the centre develops, implements and promotes modern technologies aimed at improving safety, productivity and ergonomics of equipment. The appropriate technical base with its own laboratory enables it to conduct precise measurements and calculations of performance calculations with regard to dynamics and kinematics of steel structures and machinery.

#### **KFB ACOUSTICS**

KFB Acoustics is a community of engineers and scientists in the field of acoustics whose mission is to share their methods and knowledge in order to help clients create the most innovative products and solutions. The Research and Development Department of KFB Acoustics, created in 2015, is composed of experts who develop innovative technological solutions which improve functionality and safety. Thanks to the integration of different research environments, the company can verify results fast, saving time and costs and observing the highest quality. KFB Acoustics tests a broad range of products acoustically, cooperating with other firms and academic institutions in order to achieve long--term technological breakthroughs. The passion for innovation shapes the future of acoustics.

#### "HAK" ENTERPRISE

The Research and Development Centre of the "HAK" Enterprise is an entity with the fundamental goal of conducting applied and industrial research in the field of mechanics, automation, and machinery construction in the area of handling and maintenance. In its activity, the centre deals with development, implementation and promotion of innovative technologies aimed at improving productivity, safety and ergonomics of equipment. Conducting wide-scale research and benefitting from external knowledge and achievements, the entity focuses on satisfying market needs by providing modern and advanced technologies.

#### TECHLAND

Techland is a Polish games developer known from the "Dying Light" and "Dead Island" series. The company established in 1991 places a great The data presented show dynamic development of research and development activity in the Lower Silesian voivodship, with a significant increase in the number of R&D entities and investments in this sector. The contribution of businesses from Wroclaw, which play a key role in driving innovation and technological progress in the region, is particularly apparent.

# 2.2. Analysis of R&D and incubators operating by academic centres

R&D by academic centres plays a key role in innovations and economic development, supporting technology transfer and commercialisation of scientific research. Wroclaw universities are actively involved in the creation of business incubators and research and development centres.

These initiatives integrate research potential with business practice, enabling the development of new technologies and supporting innovative enterprises. Thanks to this, the Wroclawia region is becoming a dynamic environment for academic entrepreneurship, supporting growth and job creation.

#### **University of Wroclaw**

#### TECHNOLOGY TRANSFER CENTRE (CTT)

CTT is a general university unit, set up in order to support the research and technological potential of the University of Wroclaw as well as the transfer of research results into the economy. The fundamental goal of operation of this entity is direct commercialisation of results of scientific research. The Academic Business Consultation Point of the University of Wroclaw operates as part of CTT and it offers support to students, graduates and employees of the University in implementation of business ideas.

#### Wroclaw University of Science and Technology

#### GEO-3EM RESEARCH CENTRE

The GEO-3EM undertaking is a research and technology transfer centre that is unique on the European scale. It operates in the field of sustainable use of resources and energy originating from various sources with focus on issues connected with natural environment protection. It is composed of R&D infrastructure for use by five research units of Wroclaw University of Science and Technology, encompassing a new building as well as scientific and research apparatus worth around PLN 72 million, located in 12 laboratories.

#### ACADEMIC BUSINESS INCUBATOR

Academic Businss Incubator of Wroclaw University of Science and Technology (AIP PWr) is an initiative aimed at supporting entrepreneurship in the academic community. The incubator offers space and resources for developing business ideas, cooperating with business practitioners and university staff. Participants use the infrastructure of the University as well as Wroclaw Technology Park, also receiving access to free consultations on accounting, law, marketing, and subsidy funds. AIP PWr focuses on supporting technical and technological projects, from concepts to product marketing. The programme also offers creative and educational workshops which help participants in creating new business ideas in cooperation with external partners. The incubator constitutes part of the Lower Silesian Academic Business Incubator.

#### INNOVATION AND BUSINESS CENTRE

The Innovation and Business Centre of Wroclaw University of Science and Technology specialises in combining science and technology with business. The entity supports commercialisation of scientific research and helps entrepreneurs to implement innovations. It cooperates with Wroclaw Technology Transfer Centre and handles patent processes, which allows legal protection and commercialisation of inventions. The Centre also solves technological problems in forms, conducts expert appraisals, and manages enterprise consortia. It uses the extensive base of Wroclaw University of Science and Technology which has over 250 laboratories and over 4600 patents.

#### WROCLAW TECHNOLOGY TRANSFER CENTRE (WROCŁAWSKIE CENTRUM TRANSFERU TECHNOLOGII)

Wroclaw Technology Transfer Centre (WCTT) at Wroclaw University of Science and Technology plays a key role in the promotion and support of commercialisation of scientific research and implementation of innovations in industry. The Centre focuses on comprehensive servicing of commercialisation processes, including the analysis of market potential of new technologies, legal protection of research results, and seeking out buyers and financing for new solutions. WCTT also facilitates cooperation between research teams and the industrial sector through the organisation of specialist training courses and advisory services with regard to commercialisation methods.

#### Silesian Piasts Medical University (Uniwersytet Medyczny im. Piastów Śląskich)

#### **PROJECT MANAGEMENT CENTRE**

The Silesian Piasts Medical University has a Project Management Centre whose objective is to actively support employees in raising funds for research from various sources, including domestic, foreign, and own. Additionally, the entity acquires funds for investments and development of the university, protection of results of scientific research or development work, as well as commercialisation of those results. The Centre also ensures correct implementation and settlement of projects.

#### TECHNOLOGY TRANSFER CENTRE (CENTRUM TRANSFERU TECHNOLOGII)

The Technology Transfer Centre of the Silesian Piasts Medical University in Wroclaw (CTT) has been established to support cooperation with the economy, manage intellectual property, promote innovations and academic business development. The Centre deals with evaluation of projects in terms of their commercialisation potential, it manages the university's intellectual property, conducts technology transfer processes, and conducts service activity of business nature. Additionally, CTT becomes involved in the creation of partnerships and consortia, it promotes scientific and research achievements of the university and supports HR development with regard to commercialisation competences.

#### University of Natural Sciences in Wroclaw

#### ACADEMIC BUSINESS INCUBATOR

The Academic Business Incubator of the University of Natural Sciences in Wroclaw constitutes an innovative environment supporting the development of entrepreneurship among students, doctoral students and scientific personnel. The incubator combined theoretical aspects with business practice, offering beginner entrepreneurs assistance in establishing their own firms, access to a network of business contacts, and co-working space. Participants may benefit from mentoring, advisory services, and take part in training sessions and workshops developing business skills. The incubator also offers support in acquiring financing, among other things through access to information about subsidies and funding programmes. Additionally, the cooperation with Wroclaw Technology Park ensures preferential terms for rental of space.

#### RESEARCH AND DEVELOPMENT CENTRE

The Research and Development Centre of the University of Natural Sciences in Wroclaw plays a key function in integrating scientific research with business practice. It offers research and advisory services, helps with applying for funds for R&D projects, and supports academic business development. The Centre uses modern laboratories which provide a wide range of analytical services for the industry, which facilitates the transfer of technologies and innovations.

#### **Economic University in Wroclaw**

### INQUBE UNIVERSITY BUSINESS INCUBATOR

The Business Incubator of the Economic University in Wroclaw creates a dynamic and innovative environment which drives the development of academic business. It combines the world of science with business practice, making it possible to start and develop your own undertaking. It offers a broad scope of support, services and resources for beginner entrepreneurs:

- Mentoring and consultancy: provides support and advice on establishing your own business, writing a business plan, and clarifies accounting and tax issues.
- Access to a network of contacts: makes it possible to initiate contacts

with business partners, mentors and other entrepreneurs thanks to business connections, partnerships and external relationships.

- Co-working space: offers access to the technical base and a conference room within the EU.
- Training and workshops: organises training sessions, workshops and educational events which help in the development of business skills and in gaining knowledge and competences necessary to operate your own business.
- Funding: supports entrepreneurs in acquiring funds for the development of their undertakings through the publication of information about subsidies, funding programmes, and competitions.

Thanks to the dynamically growing research and development centres and business incubators, Wroclaw universities offer their students unique opportunities for professional and academic development. These initiatives not only support the commercialisation of research and innovations, but they also create space in which young entrepreneurs may gain practical experience, initiate valuable contacts and effectively develop their business ideas. This is conducive not just to their individual development but also enhances the economic potential of the region.

#### Wroclaw Technology Park (WPT)

#### LOWER SILESIAN WPT ACADEMIC BUSINESS INCUBATOR (DOLNOŚLĄSKI AKADEMICKI INKUBATOR PRZEDSIĘBIORCZOŚCI WPT)

The Lower Silesian Academic Business Incubator (DAIP) provides support for academic entrepreneurs, i.e. students, doctoral students, graduates and academic employees who start business activity in research and development industries. Under the incubation in DAIP, for two years favourable conditions for the development of businesses set up are being created. Environment is being built that is friendly for the development of firms prepared for independent functioning in the market. Academic entrepreneurship at universities is promoted so as to show that own business creates an opportunity for commercialisation of scientific research results in cooperation with WPT. Over 150 firms operating in more than 15 industries, including IT, chemical engineering, mechanics, electronics, biochemistry, biotechnology or medicine, benefitted from DAIP's support <sup>13</sup>.

#### SKRZYNIA INTEGRATIONAL BUSINESS INCUBATOR (INTEGRACYJNY INKUBATOR PRZEDSIĘBIORCZOŚCI SKRZYNIA)

SKRZYNIA Integrational Business Incubator, located in WPT, is an initiative created with support and development of new firms without barriers in mind. Its mission is the promotion of entrepreneurship and professional activation of persons with disabilities, as well as raising the awareness of benefits of employing such persons. The incubator offers adapted spaces, organises training sessions, workshops, provides networking and specialist support. It is a place of integration, exchange of experiences and inspirations, also used as a centre of information for entrepreneurs interested in employing persons with disabilities<sup>14</sup>.

<sup>13</sup> https://www.technologpark.pl/oferta-wpt/inkubatory-przedsiebiorczosci/daip/[access: 22.08.24].

<sup>14</sup> https://www.technologpark.pl/integracyjny-inkubator-przedsiebiorczosci/ [access: 22.08.2024].



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Wroclaw, by attracting large corporations who open their R&D centres here, becomes the place of exchange between academics and business.

Ewa Bachurska

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## Expert commentary

#### Ewa Bachurska

Director for Technology, 3M

Wroclaw is one of cities which consistently uses the potential of science to shape positive changes, attracting business to invest in local R&D teams. This is where the 3M corporation located its research and development centre where research staff, engineers and experts from many fields create innovations corresponding to global megatrends

Ther success of 3M is based on the elaborate scientific as well as research and development base which translates into innovative solutions for priority markets.

3M's Wroclaw Research and Development Centre is the key element of the company's international R&D network supporting development of new materials, technologies, product optimisation and implementation of innovations for commercialisation. R&D projects in Wroclaw are connected with the local market and clients, but at the same time they make a huge contribution to 3M's global innovation network.

The creation of solutions for climate challenges and decarbonisation plays a special role in R&D activities. Global trends, EU regulations and the growing awareness of clients and consumers require that products respond to diverse needs of their buyers, and also that they are ecological and environment-friendly – from the production process to the selection of raw materials, to their functionally.

Wroclaw, by attracting large corporations who open their R&D centres here, becomes the place of exchange between academics and business. This cooperation may make this city a leader of innovation combining science and business in response to global challenges. The synergy between universities, enterprises as well as governmental and non-governmental institutions may contribute to sustainable development and wellbeing of local communities, inspire and create a future that is driven by innovations based on science and technology.

### 2.3. Review of startups and innovations in Wroclaw

Based on the latest "Polish Startups 2023" report, we are presenting the structure and specialisation of new technological businesses in the region which stands out as a leader on the national scale. As the Startup Poland Foundation indicates, the map of Polish new technological firms in the recent years has remained almost unchanged. co-creator of the EMYS robot. Additionally, Olga Malinkiewicz as the first Polish woman in history, received one of the most prestigious awards for innovation in Europe – European Inventor Award 2024.

It is the Lower Silesian region that is an undeniable leader. It is where as many as 28% of all Polish startups are registered. Mazovia is in the second place (19%), and Lesser Poland – third (12%).

Startups operating in Wroclaw are highlighted on prestigious international lists. In 2023, "Deloitte Technology Fast 50 Central Europe" awarded such companies as Open Loyalty, Callstack and Deviniti. Wroclaw inhabitants win numerous awards. In 2015 - Olga Malinkiewicz and in 2017 - Jan Kędzierski received honourable mentions from MIT Technology Review and were placed on the Innovators Under 35 list. The former is the founder and CTO of Saule Technologies, appreciated for her work on the perovskite printing technology, whereas the latter is the
#### CHART 7. Startups in Lower Silesia broken down by their specialisation area<sup>15</sup>



<sup>15</sup> Polskie Startupy 2023 (Polish Startups 2023), Startup Poland Foundation.

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Wroclaw startup ecosystem undoubtedly has very strong impact on the future of technology in the whole of Poland, just like the Silicon Valley shapes trends for the entire USA.

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Mikołaj Podgórski

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# Expert commentary

#### Mikołaj Podgórski

#### COO Scanway

When you run your own business in the hi-tech and deep-tech sector in Wroclaw, you cannot fail to notice that Wroclaw technological and scientific community is very startup-rich. Even when we were students, at Wroclaw University of Science and Technology, many of our colleagues set up scientific circles, worked on very ambitious and advanced technical projects, which then naturally evolved into new technological firms.

I believe that there are several aspects which contribute to such quick and intensive development of Wroclaw startup ecosystem. First and foremost, it is the abundance of ideas which arises from the very high level of young people's education. Let's see how many prestigious universities there are in Wroclaw, educating excellent specialists in IT, broadly understood engineering, or biotechnology problems. It is not without relevance that we have various business accelerators and incubators in Wroclaw, helping small businesses find their place in the world even at the very start. For example, our firm used the Wroclaw Technology Park incubator at the beginning of its existence.

Wroclaw startup ecosystem undoubtedly has very strong impact on the future of technology in the whole of Poland, just like the Silicon Valley shapes trends for the entire USA. Considering the diversity of startups, almost each of contemporary sectors has its share in the ecosystem, although, undoubtedly, we are experiencing a drain of talented young people to large corporations and IT firms of which Wroclaw is the Polish capital. On the other hand, it is clear that Wroclaw ecosystem closely follows the trends of the world technology development, and for example as regards the number of startups, the largest number of them specialise in AI/ML, SaaS and hi-tech/deep-tech.

It is in Wroclaw that a lot of startups were established, thus significantly raising Poland's technological level, e.g. PayEye, Infermedica or Brand24. Most definitely, our Scanway also has quite a significant impact on the development of advanced technologies in Poland – in our case this is the space sector.

It is thanks to our presence in Wroclaw that we are the only firm in Poland and one of very few in the world to develop vision instruments and telescopes for space applications. Wroclaw has become one of the key innovation and startup centres in Poland. The city attracts young entrepreneurs and investors, creating a dynamic environment supporting the development of modern technologies. Many incubators and accelerators operate in the city, offering support for young firms.

Wroclaw's success should be seen first and foremost in the support from local authorities, strong academic and research infrastructure, and active business support environment.

Local government understands the importance of innovation for the economic development of the region, and this is why they offer extensive support for new enterprises, becoming actively involved in the development of the ecosystem - from incubation programmes to financial and consultancy assistance. Wroclaw Agglomeration Development Agency (ARAW) plays the key role in promoting and supporting the local startup ecosystem. Through the Startup Wroclaw initiative, the Agency functions as a coordinator and organiser of that ecosystem, concentrating on the identification of startups' needs and responding to them. Startup Wroclaw attaches a lot of importance to the networking aspect of entrepreneurship. It offers extensive support which encompasses organisation of events such as conferences and meetups, industry publications, as well as daily meetings to exchange knowledge about technologies and the ecosystem.

The Agency focuses in particular on supporting entrepreneurship through connecting local players and promoting cooperation between different sectors, such as universities, business and business environment institutions. Thanks to this, entrepreneurs can benefit from mentoring and gain experience necessary to develop and scale their business.

Entities such Wroclaw Technology Park constitute key resources which enable startups to access necessary tools and funding, thus supporting their development and innovativeness. Universities and research institutes in the city provide talents and modern research which supports the commercialisation of innovations. These institutions work closely with the industry, which makes it possible to apply in practice the scientific discoveries and to develop new technologies.

Additionally, Wroclaw is characterised by a rich business support environment, with numerous accelerators, coworking spaces, and business networks available. Such structures support the exchange of knowledge, experience, and creation of valuable business contacts. Thanks to this, young entrepreneurs and innovators have an opportunity for developing their ideas in an environment that supports creativity and cooperation, at the same time attracting investments which are key for dynamic growth and development.

The capital of Lower Silesia is also a location of many conferences and events connected with innovations. Examples include: React Universe Conf (formerly React Native EU), UPGRADE, Made in Wroclaw, Startup WRO Meetup, Evolutions: Meetup & Showcase. Startups from Wroclaw stand out in Poland in various areas, marketing numerous innovations. It is worth mentioning some of them:

#### Alokai

offering innovative solutions for creating fast and high-quality online store websites;

#### Alphamoon

which automates the processing of documents in companies by using artificial intelligence and NLP;

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#### **Bioceltix**

is the first biotechnological veterinary company listed in the main market of the Warsaw Stock Exchange, specialising in the creation of modern stem cell-based therapies for animals;

#### **Biotts**

works on novel forms of drugs (creams and patches) for such diseases as cancer, diabetes and COVID-19, offering alternatives to tablets and injections;

#### Brand24

is an Internet monitoring and reputation management tool, providing deep analyses and reports on consumer behaviours;

#### CUX

is a pioneering tool for UX automation and analytics, streamlining sales in the e-commerce sector through elimination of sales barriers

#### Infermedica

specialises in tools based on artificial intelligence, supporting diagnostics and medical care, whereas their application Symptomate helps analyse symptoms and suggests possible diagnoses;

#### Lock.me

revolutionises the escape room industry, offering a search engine with rich filtration and categorisation functions on the basis of user reviews

#### PayEye

which one of the first companies in the world to introduce a payment system based on iris and face biometrics. The complex solution encompasses biometric POS devices, a mobile application, and advanced biometric data processing algorithms, ensuring independence and security;

#### **PixelAnt Games**

which is part of Sumo Digital, works on the

most recognisable AAA/AA+ games, such as Forza Horizon, Hitman and Sackboy;

#### **SatRev**

focuses on the design, production and operation of satellites for real-time Earth observation;

#### **Saule Technologies**

leads innovations in photovoltaic technologies, developing new methods of using perovskites;

#### Scanway

provides advanced optoelectronic solutions for the manufacturing and space sectors, playing a key role in Polish and European space projects;

#### Surfer

facilitates SEO, making it accessible for anyone, regardless of location or education level;

#### Techland

a games developer known for its series "Dying Light" and "Dead Island", is one of the leaders of the gaming industry;

#### **Ten Square Games**

is a manufacturer and publisher of mobile and browser games, previously one of the most valuable businesses in the gaming sector on the Warsaw Stock Exchange;

#### The Knights of Unity

specialises in the outsourcing of projects in the Unity engine, reinvesting funds in the production of own games.

In the opinion of the authors of the "Polish Startups 2023" report, the power of Lower Silesia, which every year is at the top of rankings in terms of both startups being established and those already operating there, lies in its economic strength. In addition, academic and scientific communities are thriving here, and the infrastructure is better than in many of the other regions of Poland. These factors constitute pillars of development of entrepreneurship as such.

On top of this, there is favourable geographical location. Wroclaw is situated in a strategic triangle between Warsaw, Berlin and Prague. Each of these cities can be reached in under 4 hours by car from Wroclaw. For this reason, many Lower Silesian firms also have the possibility of joining the chain of subcontractors for the German industry, and this in turn stimulates further development and, in a way, may constitute an impulse for the creation of innovations and technology development by local startups.

Moreover, Wroclaw Airport, which offers a wide range of direct connections to main transfer hubs in Europe (including flights to Frankfurt, Munich, Warsaw), on average two flights to London (Luton and Stansted) and to the largest European capitals (Amsterdam, Paris, Athens, Reykjavik), is situated near the city centre.

It is also worth mentioning Concordia Design Accelerator, the purpose of which is provide assistance to dynamic and creative startups. The operator of the programme is Concordia Design Wroclaw from Wyspa Słodowa. In the years 2021-2023, it brought to Poland 31 foreign new technological firms and paid them nearly PLN 9 billion in support. Currently, under the Startup Booster project co-funded by the Polish Agency for Enterprise Development, it may offer assistance also to Polish entrepreneurs. Concordia Design focuses on effective support for Polish and foreign startups, mainly in the areas of: social impact, industry 4.0 and e-commerce at the stage of their adaptation and commercialisation, through active cooperation with the public, scientific, financial and business sector, which guarantees high effectiveness. The applicant is also planning to support firms with regard to foreign expansion, using its wide foreign network. The programme will continue until 2026 in various forms. This year, a search is conducted for startups whose solutions may be used by mature companies and public institutions (the so-called B2B/B2A path) or are interesting for investment funds (the so-called investor path).

#### Wroclaw also has an acceleration programme: Startup Booster for Social Impact provided by the SWPS University.

It is an initiative focused on supporting innovations with a positive social and environmental impact. It is addressed to innovative startups, foundations and associations which have been operating for no longer than 5 years and their goal is to make changes through their products or services.

The purpose of the programme is to accelerate the development of selected projects through their intense validation in actual industry conditions, prepare for further rounds of funding, and also support the technological development regardless of the sector. Programme participants will work 1:1 with experienced partners and will be under a constant supervision of the programme team. Moreover, they may count on system support from the SWPS University and other programme partners.

Under the programme, participants may use the following three acceleration paths:

- Industry Path assumes direct cooperation with recipients of the technology, which enables startups to adapt their innovations to actual market needs,
- Venture Capital Path focuses on the preparation of startups to further funding rounds through cooperation with investors, such as venture capital funds,
- Sector Agnostic Path is allocated for the development of innovations

which have a commercial potential or social character, regardless of the cooperation with the accelerator's specific partner.

The project assumes the implementation of 5 rounds of acceleration in 3 years, with a possibility of receiving grants up to PLN 400,000. Startups will have access to mentoring, expert consultations, and training adapted to their needs. The results of acceleration will be presented during the so-called demo days, and also through further networking and post-acceleration activities supporting business development.

Startup Booster for Social Impact searches for impactful solutions which may scale up their solutions widely in order to generate large positive changes.

Projects should follow the UN sustainable development goals such as fight against social challenges as well as climate and environmental protection. The project funding of PLN 11,624,690 originates from European Funds, which emphasises its importance and scale.

It is also worth mentioning that ARAW is a partner of the project by PARP (Polish Agency for Enterprise Development) entitled "**Innovator's Laboratory**", a programme financed from the resources of European Funds for Modern Economy (FENG). Domestic entities acting for innovation, with experience in implementation of programmes supporting innovative business ideas of individuals or startups could apply for subsidies under the measure. An entity acting for innovation should be understood in particular as business environment institution operating in support of increased innovation of enterprises and the economy, including: technology transfer centres, innovation centres, technological incubators, academic business incubators, technology parks. As a result of implementation of the "Innovator's Laboratory" programme, by 2026 over 1000 inventors will receive professional assistance in determining the conditions of conducting the startup activity.

The analysis of data shows that Lower Silesian voivoship, and Wroclaw in particular, plays a key role in the ecosystem of Polish startups. This region, thanks to its strong economy, thriving academic communities, and strategic location, not only attracts young innovative firms, but also stimulates their development.

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I believe that startups in Wroclaw may count on extensive support, both or the local and global level.

Dariusz Wróblewski

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# Expert commentary

#### Dariusz Wróblewski

Manager R&D (Software), XTPL

Thanks to the experience I have managed to gain, not only working directly in startups but also as part of cooperation, both as a client and as a contractor, I had the opportunity to observe, and as a result evaluate, the potential offered by Wroclaw in the aspect of business development.

Based on this, I can say in full consciousness that such strong development of startups in Wroclaw is the effect of several key factors which support not just local innovations but also global ambitions of young firms. Which is more, I will dare claim that from the point of view of startups, Wroclaw offers wide opportunities of development which stem among other things from the availability of ambitious, well-educated and experienced employees, institutional support, including development programmes, and general global availability of capital (investors and clients).

Focusing on specifics, I would list the following as key factors affecting the development of startups in Wroclaw:

### 1. Access to highly qualified personnel:

 Wroclaw is one of the main educational centres in Poland, with a strong academic base, which ensures the constant inflow of young, educated specialists.

- The city attracts not just Polish employees, but also talent from abroad. The high standard of living, dynamic labour market, and international environment all combine to make Wroclaw an attractive place to live and work for people from other countries.
- Startups may benefit from various specialists not only in the IT sector, but also such sectors as engineering, biotechnology, finance or logistics.

### 2. Support for the startup ecosystem:

- Wroclaw has an extensive startup support infrastructure, including numerous incubators, accelerators, or coworking spaces, such as Wroclaw Technology Park, Academic Business Incubator, InQUBE University Business Incubator, etc.
- Startups have access to mentors, training and development programmes which help them scale up their activity and increase their chance of achieving market success.
- Numerous networking events and conferences are organised, and they support the initiation of key business contacts, and they promote initiatives and firms created and developed in Wroclaw, e.g. Made In Wroclaw.

#### 3. Presence of foreign firms:

- Wroclaw is the base for many foreign firms, particularly from the IT sector, but also other sectors, which operate their research and development (R&D) centres. The presence of these firms increases the local technology market and creates the possibility of cooperation for startups.
- Thanks to foreign firms, it is much easier for startups in Wroclaw to acquire international clients and investors, which supports their global development.
- International environment also supports the growth of innovativeness, exchange of experiences, and acquisition of new partnerships.

#### 4. Access to capital and investors:

- Wroclaw is well-integrated with Polish and European venture capital market. More and more investment funds and business angels are looking here for innovative projects to support.
- Startups also have access to programmes of subsidisation from EU and national funds which help in the development of technology and expansion to new markets.

### 5. Attractiveness of the city as a business centre:

- Wroclaw is characterised by dynamic economic development, modern infrastructure and friendly business environment, which enables startups to develop in favourable conditions.
- The city attracts talents and investors not only from Poland but from all over the world, thanks to which startups have

extensive opportunities of cooperation at the international level.

 The capital of Lower Silesia has good transport links to the rest of Europe and has access to developed transport infrastructure, it is a convenient base for conducting international operations (including direct access to an airport).

#### 6. Innovation and business culture:

- Wroclaw promotes business and innovation culture, supporting startups in their search for novel solutions and going beyond established conventions.
- The local ecosystem supports the crossing of technological barriers, integration of science, business, and even art in the process of creation of innovative projects, which increases the competitiveness of startups in the global market.

I believe that startups in Wroclaw may count on extensive support, both on the local and global level. The high quality of education, availability of talented personnel, close cooperation with international firms and well-developed ecosystem all make Wroclaw an excellent place to set up and develop innovative firms.



## 2.4. Evaluation of human resources and their potential in the R&D area in Wroclaw

## Assessment of availability of qualified specialists in the R&D area

In the assessment of availability of qualified specialists in the R&D area, 16% of respondents deem it very good and 44% – rather good, which means that 60% of firms in total have a positive opinion of the possibility of finding employees in this area. Nevertheless, 23% of firms believe that availability is rather bad, and 2% judge it to be very bad, which indicates certain difficulties and challenges in the recruitment of appropriately qualified staff. Additionally, 16% of respondents do not have an equivocal opinion on this issue, which might suggest volatility and uncertainty in the labour market as regards R&D.

#### Strengths of human resources in Wroclaw in the aspect of R&D development

The analysis of strengths of human resources in Wroclaw in the context of R&D development points to several key factors. The most frequently mentioned advantage is the high level of education with 71% of responses, which emphasises the importance of well-educated employees for business conducting research and development activity. Creativity and innovation, mentioned by 60% of respondents, and knowledge of modern technologies (52%) also constitute important assets which are key for innovative projects and technological development.

#### CHART 8.

#### Assessment of availability of qualifie specialists in the R&D area



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Extensive professional experience as well as flexibility and adaptivity (both 40% each) are further important features which allow quick adaptation to the changing requirements of the market and the technology. Strong connections with universities and research institutes indicated by 28% respondents underscore the role of cooperation between the industry and the sector of education and scientific research.

Considerable availability of IT specialists (27%) and good project management skills (25%) also play an important role in the effectiveness of R&D activities. It is also worth noticing that only 4% of respondents believe that human resources in Wroclaw have no strengths, which points to a generally positive evaluation of competences of employees in this region. Additionally, respondents pointed to other strengths of human resources in Wroclaw, such as availability of specialists from Belarus and Ukraine, positive attitude to work (can-do attitude), willingness to work on interesting projects, willingness to learn, and large number of young engineers who, in time, become good specialists. These factors additionally increase the competitiveness of the labour market in the R&D area in Wroclaw, creating a dynamic and innovative work environment.

The availability of qualified specialists in the R&D area in Wroclaw is generally viewed positively, despite some challenges. High level of education, creativity, innovation, knowledge of modern technologies, and strong connections with academic institutions constitute key assets which contribute to the expansion of research and development activity in the region.

#### CHART 9.



#### Strengths of human resources in Wroclaw in the aspect of R&D development





# Potential of the Wroclaw market for the expansion of R&D

PART 3

# 3.1. System of education and academic cooperation in Wroclaw

Wroclaw has a considerable education potential in the context of research and development, which is supported by several key factors based on available data. The city is home to 30 universities which educate 105,184 students, creating a strong intellectual base and human resources key for the R&D activity. Every year, 26,675 graduates leave the city, regularly supplying the labour market with qualified specialists. Over 42,000 students are educated in key fields such as engineering, technical, natural and medical sciences, which constitutes around 40% of all students.

Wroclaw universities are among the best in the country. In the "Perspektywy" magazine

ranking, in 2023 Wroclaw University of Science and Technology is in the high 8th place, which constitutes evidence of its strong position among technological universities in Poland. Silesian Piasts Medical University in Wroclaw came 16th, University of Wroclaw – 19th, and University of Natural Sciences in Wroclaw was in the 30th place. The ranking covers 102 universities and encompasses Polish universities that are competent to award the doctoral degree in at least one science discipline and educate minimum 200 students in full-time studies. Universities are awarded points in such categories as: graduate in the labour market, scientific potential, or scientific effectiveness.

Data for the years 2022/2023<sup>16</sup>

Universities	30
Students	105 184
Graduates	29 300

<sup>16</sup> Office of Statistics in Wroclaw, update/supplementation: Wroclaw Academic Centre.

#### CHART 10. Number of students in 2022/2023 according to fields of study<sup>17</sup>



CHART 11. The largest Universities in the Wroclaw agglomeration in terms of student number<sup>18</sup>



17 RAD-ON, Information Processing Centre, https://radon.nauka.gov.pl/.

<sup>18</sup> Higher education in the academic year 2023/2024, Statistics Poland.

#### CHART 12. The most prestigious Wroclaw universities in the "Perspektywy" magazine ranking of 2023<sup>19</sup>

	Place in ranking
Wroclaw University of Science and Technology	8th
Silesian Piasts Medical University of Wroclaw	16th
University of Wroclaw	19th
University of Natural Sciences in Wroclaw	30th

Besides universities, there are also many other research entities in the Wroclaw agglomeration, which offers scope for cooperation with Lower Silesian and national industry and services. These include:

#### 4 independent institutes of the Polish Academy of Sciences (PAN)

Ludwik Hirszfeld Institute of Immunology and Experimental Therapy, Włodzimierz Trzebiatowski Institute of Low Temperatures and Structure Research, Anthropology Unit in Wroclaw;

#### 8 field branches of scientific units of the Polish Academy of Sciences (PAN)

including e.g. Space Research Centre - Solar Physics Division, Institute of Mathematics, Institute of Nature Conservation;

#### Other research centres, e.g.:

Wroclaw Technology Park, Łukasiewicz – PORT Research Network in Wroclaw, Lower Silesian Innovation and Science Park, KGHM CUPRUM Research and Development Centre, Institute of Energy System Automation, Research and Development Centre of the Voivodship Specialist Hospital in Wroclaw.

<sup>19</sup> Ranking of Universities 2023, "Perspektywy". https://2023.ranking.perspektywy.pl/ranking/ranking-uczelni-akademickich [access: 27.08.24] The ranking encompasses 102 universities.



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Besides the development of new technologies, the University is also actively seeking business partners interested in their implementation.

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Jakub Sojka

# Expert commentary

#### Jakub Sojka

Director for the Technology Transfer Centre, Medical University of Wroclaw,

### Education: Fields of study and education potential

The Medical University has significant potential in the education of specialists in the R&D area. There are some subjects that are particularly important in this context, such as pharmacy, which is the natural partner for the industry and enterprises, allowing the development of new technologies, services and products, as well as health sciences which focus on modern technologies and offer extensive research opportunities. It is in these faculties that intensive research work is conducted that has direct application in the medical and pharmaceutical sector. In turn, the priority in medical studies is to prepare students for direct work with patients, whereas research and development play a supportive role and are not the main element of the programme of education.

The University is also involved in student exchange programmes and cooperation with foreign research centres, which enables students and researchers to participate in international projects, exchange knowledge, and develop competences at a world-class level.

### Cooperation with the business community

The University actively cooperates with the business sector in the area of research and development on two main platforms. Firstly, research services are provided on request from businesses which are looking for technological solutions. An example of such cooperation is where a firm commissions a research project in order to develop a new technology or an innovative product.

Another aspect of cooperation is commercialisation of technologies created at the university as a result of the research activities of its employees.

Besides the development of new technologies, the University is also actively seeking business partners interested in their implementation. This process encompasses patenting inventions and commercialisation of products.

An example of such initiatives is the design of an application based on artificial intelligence which supports the medical personnel in diagnosing children up to two years old at emergency departments. Another project, implemented in cooperation with an external firm, concerns the development of software supporting didactic processes, in which psychiatrists from the Medical University help improve the artificial intelligence component.

Additionally, projects in the field of stomatology are conducted, developing new treatment techniques and methods, often financed from EU funds. The results of these projects are implemented by firms in the healthcare process, which underscores the key role of cooperation between science and business in the development of medical innovations.

#### Scientific works and research

The Medical University in Wroclaw is the highest ranked Polish medical university in global rankings. This success is the product of publications, projects, as well as teaching and scientific activity of its employees, which is reflected in the growing number of grants and patent applications. Research is also carried out as part of international projects, such as those concerning palliative care for patients with cardiac insufficiency or the stomach cancer screening strategy.

The University also offers implementation doctoral degrees which combine scientific research with the practical implementation of their results in industry. Under the programme, a doctoral student initiates cooperation with an entrepreneur and develops a specific solution or solves a technological problem that has appeared in the entrepreneur's business.

#### **Development prospects**

The development plans of the Medical University of Wroclaw in the context of R&D for the next few years include further development of innovations in medicine, particularly in the area of medtech, artificial intelligence and diagnostics. For this purpose, we have changed the formula of the Health Sciences Faculty which is to become a centre focused on innovations and cooperation with business. One of the manifestations of this are master's theses completed as part of the implementation. We are moving away from theoretical papers written exclusively in order to obtain the master's degree. We want them to be specific, necessary and implemented solutions. Thanks to this our research will have an actual impact on the university's surroundings and respond to our business partners' needs.

Currently, the key challenge is to initiate effective cooperation between research entities and the industry due to the fact that such sectors as medicine and biotechnology require significant financial outlays. The introduction of more effective funding mechanisms and increasing the awareness of tax reliefs, such as the R&D relief, could significantly increase the investment in these fields. In order to support innovations, also the administrative process connected with the financing of R&D projects must be more efficient, which will enable the scientists to focus on their research and not on bureaucracy.

The Medical University of Wroclaw is undoubtedly an interesting partner for the business sector. Health is and will continue to be a strategic goal for our country. Medical sciences are also among the fastest growing research areas, and what is important – closely cooperating with international centres. Streamlining legal issues, which often constitute the main obstacle in the cooperation between the university and the business community, is key to us becoming truly competitive. We need a national discussion including the broadest group of stakeholders possible in order to develop improvements that we all need.

#### Opportunities for subsidisation of studies in the Lower Silesian voivodship

There are many study subsidisation programmes available in Poland, helping students in covering the costs connected with education. On the national level, there are among other things government scholarships, such as the **Scholarship of the Prime Minister**, awarded for outstanding scientific achievements, and the **Scholarship of the Minister of Education and Science**, for above-average students on the national or international level, both in the area of sciences and arts. Most universities also offer the **Vice Chancellor's Scholarship for the best students**.

National Centre of Research and Development (NCBR) offers numerous scholarship programmes supporting innovative research projects to undergraduate and doctoral students interested in scientific research. In turn, the Foundation for Polish Science (FNP) conducts programmes such as START, which support young scientists at the beginning of their academic career, and other scholarships addressed to outstanding undergraduate and doctoral students.

Students from Wroclaw may also **apply for a partial funding under the Student Scholarship Programme**. This is financial support for Wroclaw undergraduate and doctoral students offered by the city which constitutes a reward for the effort put into scientific development, motivation for continued work, and achieving the best results. Under the programme, the city offers scholarships for doctoral students, laureates of contests and competitions and students going abroad.

Moreover, for students with a certified disability, the **"Active Local Government"** programme offers financial assistance to cover the costs of education, which enables them to access education on equal terms. It is also worth pointing out that all universities, higher education establishments and educational institutions in Poland offer a wide range of financial support for their students. Besides standard scholarship and maintenance grants allocated on the basis of learning outcomes or financial situation, universities often cooperate with various institutions to offer additional forms of subsidising studies, e.g. job centres.

The University of Wroclaw offers also NAWA scholarships as well as Young Researcher scholarships and grants.

The NAWA funds are intended for foreign students studying in Poland and Polish students on overseas parts of their studies and on study visits abroad.

The amount of the monthly grant varies depending on the programme and the study cycle. In turn, the **Young Researcher** funds are allocated under the "Excellence Initiative – Research University" programme. Scholarships are intended for first-year students in order to support their scientific and research competencies through participation in science circles and research, and grants for undergraduate and doctoral students in order to facilitate contacts with the international researcher community. Grants may be awarded i.a. for the participation in a foreign science conference or to cover costs of a period of study at a foreign university.

Wroclaw University of Science and Technology offers many programmes aimed at encouraging students from other cities to undertake studies in Wroclaw.

The University offers between PLN 400 and 700 of a monthly scholarship during the first year of studies for those highly talented with very good results in education, as well as one-year support from a tutor and a guaranteed place in student halls. Winners of contests are covered by the Eagle School (Szkoła Orłów) programme in which students can receive over PLN 1300 a month. Besides the maintenance grant, bridging grants are also offered by the Business Education Foundation (Fundacja Edukacyjna Przedsiębiorczości) – these are intended for people from villages or small towns with incomes not exceeding PLN 1960 inclusive of tax. In turn, the WSB Merito Wroclaw University offers studies in fields co-funded from European Funds (EFS) under the EFS dual studies, EFS 2.0. and EFS REG projects. The funding under these projects may be obtained among other things in the following subjects: IT, management engineering, logistics, finance and accounting, and law in business.

Additional forms of support, addressed first and foremost to residents of the region, are available in the Lower Silesian voivodship. For example, the Lower Silesian Economic Cooperation Agency (Dolnośląska Agencja Współpracy Gospodarczej Sp. z o.o.) is implementing the fourth edition of the project Activation of the Lower Silesian labour market, under which participants receive the offer of, among other things, support in the form of subsidisation of postgraduate studies. The support may go to persons who are scheduled for dismissal, threatened by dismissal, or laid off due to reasons concerning their employer (i.e. economic, organisational, technological and other reasons on the part of the employer).



The University is actively involved in the local business ecosystem under the institutional cooperation.

Maciej Kamiński

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# Expert commentary

#### Maciej Kamiński

Director of the Technology Transfer Centre of the University of Wroclaw

#### Cooperation of the University of Wroclaw with the business community

The scope of this cooperation is very extensive and varied. The University of Wroclaw cooperates with many entities from the socio-economic environment, not just from the Wroclaw agglomeration but from the whole region. The recipients of the R&D services provided by the University of Wroclaw are private entities from the chemical, biotechnological, financial, pharmaceutical industry, local government entities and municipal companies (including MPWiK), State Treasury companies (including KGHM Polska Miedź SA, Stawy Milickie SA) and non--governmental organisations.

#### From 2022 to April 2024, the University conducted for external entities science and research work worth over PLN 1.6 million.

The University is actively involved in the local business ecosystem under the institutional cooperation. It is the shareholder of the Wroclaw Technology Park (Wrocławski Park Technologiczny SA) and actively participates in the work carried out by the WPT Lower Silesian Academic Business Incubator (Dolnośląski Akademicki Inkubator Przedsiębiorczości WPT). It conducts strategic cooperation with the Concordia Design Wroclaw design and creativity centre, is involved in the development of the local startup ecosystem, among other things by supporting the creation of startups through the Academic Business Consultation Point of the University of Wroclaw (Punkt Konsultacyjny Przedsiębiorczości Akademickiej UWr) and extracurricular subjects concerning academic business (University Dragon's Den, Business success stories) aimed at establishing new business entities, as well as cooperation with the Wroclaw Agglomeration Development Agency (ARAW) under the events it organises. We provide research services, e.g. on text studies and award of Simple Polish (Prosta Polszczyzna) certificates.

As part of the research carried out by the Demographics and Statistics Laboratory (Socio-Economic Geography Unit) of the University of Wroclaw, scholars conducted an expert opinion at the request of the Wroclaw Municipal Office, the aim of which was to estimate the actual population of the capital of Lower Silesia. Currently, researchers of the Integrated Planning Laboratory (Socio-Economic Geography Unit) are in the process of preparing an expert opinion commissioned by the Wroclaw Municipal Office in order to estimate the population in administrative districts surrounding Wroclaw.

#### Education of future human resources in sectors connected with research and development (R&D)

Among over 150 directions of studies at the University of Wroclaw (first and second cycle, not including postgraduate studies), it is quite easy to find subjects for future R&D specialists, particularly at the faculties of biotechnology, chemistry, biology, law or Earth and environmental sciences, but also philology or history and pedagogy.

The University's assets with regard to the education of future R&D specialists is the specialised personnel and research base, contacts and cooperation with the business community, universities and foreign entities, as well as implementation of many research projects, also international ones.

The University responds to the needs of the market and its socio-economic environment on an ongoing basis. In the recent years, Medical Biotechnology (second cycle studies) and Medical Molecular Biotechnology (uniform master's degree studies) were launched. But this is not all. Several new key specialties on the second cycle studies have also been created – in the field of biotechnology: medical biology, system biology and bioinformatics, biomedical technologies. New subjects have also been established in adjacent areas, e.g. ethics (studies addressed to people interested not just in working as a teacher, but also in various committees and expert bodies), or e-business law (the purpose of education is to develop digital and legal competences necessary in modern business transactions). At the Faculty of Mathematics and Informatics, in turn, there are plans to create a new field of studies connected with artificial intelligence next year.

### Green energy at the University of Wroclaw (UWr)

UWr is also in the process of developing a model of energy transformation in the operation of universities, which is a pilot model on the national scale. The development of that model is the objective of an agreement signed a year ago between representatives of Chancellors and Vice Chancellors of public universities from the Lower Silesia and Opole regions, the National Energy Conservation Agency (Krajowa Agencja Poszanowania Energii) and the Environmental Protection Bank (Banku Ochrony Środowiska). And one of the most important tasks of the Green Energy Inter-university Group (Miedzyuczelniana Grupa Zielona Energia) will be shared applications for money from EU funds connected with renewable energy, so that from a consumer they can turn into a producer of green energy.

The initiatives which are particularly worth mentioning in the contest of cooperation between UWr and the socio-economic environment include:

- research services with regard to text studies and awarding of Simple Polish certificates to the Credit Agricole bank;
- expert cooperation on history during the

creation of a computer game together with the Giant Lazer company;

- participation in the Nutribiomed cluster and conducting shared scientific research;
- business and development cooperation with the Scanway company;
- cooperation with the Wroclaw branch of Smith&Nephew with regard to activities for students and graduates (internships, training placements);
- implementation of projects under the "Mozart" Municipal Programme with firms: Wroclaw Industry Park, Concordia Design Wroclaw, Sony Poland;
- implementation of the Startup Booster implementation project in partnership with Concordia Design Wroclaw;
- cooperation with UMWD with regard to the development of the Lower Silesian Innovation Strategy 2030;
- expert cooperation with Business Centre Club – Lower Silesian Lodge;
- expert cooperation with the Association of Organisers of Innovation and Business Centres in Poland;
- cooperation with NCBR under a strategic programme of scientific research and development work "Social and economic development of Poland under the conditions of globalising markets – GOSPOSTRATEG" – expert participation and implementation of the project;
- cooperation with the Łukasiewicz Research Network – completion of implementation doctoral theses, institutional and expert cooperation;
- activities under HYDROPROG and SARUAV;

- cooperation with the Wroclaw district (re. demographic surveys), as well as Orlen Synthos;
- cooperation between the Biotechnology Faculty and private enterprises with regard to the implementation of projects, research services, preparing expert opinions, reports and studies. This is extensive cooperation with firms from the biotechnology and pharmaceutical industry (including Celon Pharma SA, Pure Biologics SA, Lipid Systems sp. z o.o., Acellmed sp. z o.o. or Inventionbio sp. z o.o., as well as Wroclawski Park Technologiczny SA, Lipid Systems sp. z o.o.). As regards conducting and funding innovative scientific research, the Biotechnology Faculty cooperates among others with Oslo University Hospital, Canadian firm Applied Biological Materials, Italian, Czech, German and other universities.

#### Cooperation of the Biotechnology Faculty – details:

- Oslo University Hospital / The Norwegian Radium Hospital (Department of Biochemistry, Institute for Cancer Research) under the project POLNOR "Novel targeted therapy based on warhead conjugates FGFR – dependent cancers";
- Agreement with the Canadian firm Applied Biological Materials Inc. concerning a licence of selling a human melanoma cell line resistant to the BRAf inhibitor vemurafenib. Agreement signed on 17.04.2023;
- Bilateral exchange of scientists between Poland (UWr) and Italy (Pavia) CANALET-TO (ref. No. PPN/BIL/2018/2/00020);
- Cooperation between a research team from Czechia under the project implemented by the Biotechnology Department, entitled "Structural changes of fibrobla-

stic growth factors as a tool for explaining mechanisms of diverse cell response" – project under the NCN – CEUS-UNISO-NO competition for bilateral or trilateral research projects for teams from Austria, Czechia, Slovenia and Poland;

- Agreement for the completion of a research placement concluded between the Biotechnology Faculty and CIIMAR Centro Interdisciplinar de Investigação Marinha e Ambienal University of Porto, NIPC 508792657, Terminal de Cruzeiros do Porto de Leixões, Avenida General Norton de Matos, S/N, 4450-208 Matosinhos, Portugal;
- Agreement for the completion of a research placement concluded between the Biotechnology Faculty and University Regensburg with its seat at Universitätsstraße 31 93053 Regensburg Deutschland NIP: DE 811 335 517;
- Agreement on cooperation between the Biotechnology Faculty of the University of Wroclaw and the University of Vilnius concerning a shared PhD dissertation;
- Postdoctoral placement in Sigmoid Pharma Ltd., Dublin Ireland, Formulation Scientist in the project "Integrated Oral Drug Delivery System (IODDS) (MTKI--CT-2005-030044) funded by the European Commission under the Marie Curie Fellowship for the Transfer of Knowledge (Marie Curie Industry-Academia Strategic Partnership Scheme), action 6. of the European Union Framework Programme for Research and Technical Development, 2008/05-2009/02."

The survey conducted by ARAW and Antal indicates that 58% of firms cooperate with local universities, offering internships and training for students.

Shared research projects are implemented by 37% businesses, which underscores the importance of the academic contribution to the development of technology and innovation. Consulting activity accounts for 26% of cooperation, and 24% firms cooperate on research grants. However, 21% of firms do not undertake any forms of cooperation with universities, which may indicate potential barriers or lack of awareness of benefits arising from such partnerships. Organisation of events and conferences is practised by 17% of firms, whereas training and courses for employees are offered by 12% of them.

Other forms of cooperation (7%) encompass various activities, such as product research, conducting lectures and practical classes, using university's labs, doctoral studies, implementation doctorates, commissioning specialist research, and using the available analytical apparatus.

#### CHART 13.

#### Types of cooperation undertaken by firms with local universities under the R&D projects



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Also the cooperation with business constitutes the foundation of our strategy. We develop dual studies which are partly carried out physically in partner firms.

# Expert commentary

#### Katarzyna Skowron

Director of the Innovation and Business Center, Wroclaw University of Science and Technology

### Education: Fields of study and educational potential

As part of the latest strategy of Wroclaw University of Science and Technology, we place strong emphasis on **synergy of technical sciences and social sciences**. We want our students to be prepared to work in a modern economy which requires diverse competences. It is a model implemented at European and US universities where technical universities provide also education in economy or other social sciences.

We implement this strategy, launching further innovative education methods, e.g. challengebased learning, problembased learning, or learning by research, aimed at problem solving or the project approach.

The University of Technology also has the Didactic Excellence Centre whose overriding goal is to develop and support activities for excellence and modernisation of teaching at first and second cycle studies, as part of the Doctoral School, postgraduate studies, and other forms of education at Wroclaw University of Science and Technology, as well as promoting the best teaching practices in the context of modern global solutions.

Also the **cooperation with business** constitutes the foundation of our strategy. We develop dual studies which are partly carried out physically in partner firms. This approach, already known from previous years, will now be developed even further. Students have an opportunity of working on actual research and development projects, which enables them to gain valuable experience in the R&D area even before graduation.

Wroclaw University of Science and Technology has noticed the growing demand for specialists in fields combining **technology and medicine**, this is why it launched new subjects, such as the biomedical engineering. Students in these fields of study will participate in interdisciplinary research at the meeting point of health sciences and technology. This is a response to the labour market needs, but also the dynamic development of technology, which have a direct impact on progress in medicine.

However, the education process means not just programmes and methods, but also people and communities. This is why we are supporting 69

our students, offering them the possibility of becoming active in academic circles of which there are over **250** at our University. We are very proud of achievements of these circles which take the highest places in competitions in the field of mechanics, robotics, space and aviation technologies, but also mathematics, IT and cybersecurity, and many other fields.

Our teaching staff includes mainly active researchers who also cooperate with the business community on an ongoing basis.

Thanks to this, study programmes are strictly integrated with scientific research conducted. Students are in direct contact with the latest achievements in their respective fields, which not only enriches their knowledge but also inspires them to undertake independent research.

We have an extended and continually modernised research infrastructure which may be used by our students and academics in several hundred laboratories. This enables our students to gain practical skills necessary in research work. Thanks to this, graduates leave our university with solid practical preparation. The laboratories include ones which conduct research for traditional industries – e.g. in the GEO3M centre you can find laboratories specialised to work for the mining industry. But we also have laboratories and research centres which support new branches of the economy, e.g. our Network-Supercomputer Centre has new clusters of computers for work on artificial intelligence, we also have laboratories for work on cybersecurity, an advanced laboratory for studying electromagnetic fields, an acoustics lab, 3D printing lab, Virtual Reality Laboratory, and we also create Digital Twins models.

Moreover, Wroclaw University of Science and Technology has at its disposal an **impressive research infrastructure** encompassing around 250 laboratories, of which 9 have the certificate of the Polish Accreditation Centre. Such infrastructure is necessary to conduct advanced research and to cooperate with industry. The University has **cooperation agreements with around 600 partners from 50 countries**, which makes it possible to implement shared research projects, conduct academic exchange, and apply dual diploma procedures

The key partnership for our University is the Unite! Alliance (University Network for Innovation, Technology and Engineering) in which leading European technical universities from various countries participate.

The purpose of this cooperation is the development of shared programmes of education, research and innovation at the European level. In Alliances, we are involved as a university in projects which are aimed at exchange of information about our research teams, infrastructure, projects. We continue to work on the development of opportunities for our employees to find fulfilment.

It is also worth emphasising the extensive cooperation between our University and other leading universities from Western Europe. We cooperate among other things with leading British academic centres (Cambridge or Oxford), as well as German ones, e.g. TUD Dresden. The West is not the only direction of cooperation for Wroclaw University of Science and Technology. Our University actively cooperates with universities of technology in Kyiv and Lviv, and recently we have also started cooperation with the Technical University in Zaporizhzhia. We also cooperate closely with Asian universities.

### Cooperation with the business community

First and foremost, we carry out shared implementation and research projects with many firms, particularly ones which are based in Wroclaw and Lower Silesia. Each faculty of our University has its share in this activity and it is difficult to find a sector in our region that we do not cooperate with. We also cooperate with public utility companies.

Wroclaw University of Science and Technology develops dynamically **research centres**. Their creation takes place in cooperation with local firms, particularly through the consultation of the scope of activity of the centres, their strategy and dynamics, because we want them to supplement the needs of the R&D sector as best as they can.

**Clusters** are also an important area of cooperation for Wroclaw University of Science and Technology. We belong to **36 clusters** (including **6** National Key Clusters) with regional and national reach, representing such sectors as innovative manufacturing technologies, aviation and automotive industry, renewable energy, or photonics and optical fibres. In **several of these clusters** we are a leader.

Cooperation with the socio-economic environment also encompasses student internships and implementation of dual education programmes, which makes it possible for students to gain practical experiences in R&D projects. Wroclaw University of Science and Technology also involves industry leaders in the activity of the university board and the social council of individual faculties, which ensures that research and teaching programmes suit current market needs. Wroclaw University of Science and Technology maintains relationships with nearly all important entities of the Wroclaw Agglomeration which operate in the R&D area. This concerns the industry, but also other areas such as banking, construction, services, or consulting. Often these are **large technological enterprises**, but also startups or local manufacturing firms which base their success on the development of technology and innovations..

#### On average each year we implement 200 research projects.

Laboratory tests and expert services also cannot be disregarded. It is not always required for the university to implement a project. Businesses often need niche knowledge or access to our laboratory infrastructure operated by experienced staff. We also provide such research services for our partners. We ensure that these services are implemented efficiently and at the highest quality level, this is why we established the Innovation and Business Centre whose competences include not only building project partnerships and cooperation platforms, but also as a unit it is to coordinate the provision of such services. It is enough for the company to briefly describe its need and sent it by email to <u>biznes@pwr.edu.pl</u>, and CIB coordinators will deal with the rest.

The potential of our region for the development of R&D centres is definitely very strong. We have a favourable structure of the economy, which favours innovations, a strong IT sector that cooperates closely with other sectors, including industry and mining, a new strategic partner in the semiconductor industry, a strong aviation sector, firms operating in the space sector, a banking sector which supports SMEs, and adaptation to new ecological challenges. Wroclaw's strong position as an important medical centre should also be pointed out, which combined with intensively developing technologies in medicine is conducive to innovations in our region.

The significant number of Lower Silesian institutions creating an innovation ecosystem, with which Wroclaw University of Science and Technology has been successfully cooperating for years, also constitutes an important advantage of our region.

These include Wroclaw Technology Park, Wroclaw Industry Park, Wroclaw Agglomeration Development Agency, Startup Wroclaw or the Łukasiewicz – PORT Research Network. Wroclaw, as an important academic and industry centre, attracts investors interested in creating research and development centres. It is worth adding that Wroclaw for a few years has been deemed "Polish Startup Capital" according to the Startup Poland Foundation.

Thanks to these assets, our region has a strong chance for further development as a centre with strong research and development centres. We can see this opportunity for our region when we invest significant resources into the development of our research centres.

#### Scientific work and research

Scientists from Wroclaw University of Science and Technology publish a substantial number of academic works each year. Just the Scopus database reveals over 34,000 publications connected with the University, and of these around 13,000 have been published since 2017.

Wroclaw University of Science and Technology is also the leading university in Poland in terms of patents, particularly in the field of engineering and technical sciences. In the last five years, the University notified 509 patent applications and received 387 patents.

As regards grants, Wroclaw University of Science and Technology also has something to boast about. It regularly acquires financing both from domestic and international sources, which enables it to implement advanced research and development projects. Currently, around 500 projects funded from domestic grants are being implemented, and around 100 – from international grants.

Wroclaw University of Science and Technology has been conducting research under over **100 international R&D projects**. The University is involved in numerous cooperations with leading academic centres and enterprises worldwide, which makes it possible to implement advanced research projects of great scope and impact. The thematic range is broad; from ecological production of hydrogen containers (together with KU Leuven and the Luxembourg Institute of Science and Technology) to remote mine detection in the occupied Ukraine for the NATO – Science For Peace programme.

Wroclaw University of Science and Technology can boast **high places in prestigious rankings**, such as the Shanghai global ranking of academic subjects, or QS ranking by subject. Each discovery and invention, each project which enables us to live better and contributes to the solving of problems which the humanity has to cope with is just as important for us. It is difficult to list several most important ones because it should be emphasised yet again that Wroclaw University of Science and Technology has its significant share in inventions in nearly every area of life. Our scientists have contributed significantly to space technologies, fight against
climate change, water management, energy management, or modernisation of traditional branches of the economy. It is impossible to list all achievements.

A feature which makes our doctoral programmes stand out is their strong integration with research and development programmes.

In the recent years, our young scientists carried out over 70 implementation doctorates with the largest representatives of diverse industries – among them energy, chemical, mining, manufacturing or telecommunications industries.

We also promote academic mobility of PhD students and cooperation with foreign research centres. Agreements concluded by Wroclaw University of Science and Technology with reputable foreign scientific centres give our doctoral students an opportunity to carry out some of their research in these very centres.

PhD students also have the possibility of participating in programmes supporting the establishment of technological startups, which promotes their development as future innovation leaders.

### **Development prospects**

In this day and age, the ability to cope with interdisciplinary issues is necessary for the development of innovations. We want these features to refer both to research and teaching, which may be achieved through individualisation and **interdisciplinary nature of teaching**. We also know that it will be necessary to **undertake pioneering and breakthrough research** in key areas of science and technology that will respond to the expectations of the society and the economy, and will also move the boundaries of knowledge in those areas. Additionally, it will also be necessary to **create a dynamic academic community** which will integrate researchers and students of different level in different disciplines, promote cooperation, innovation, interdisciplinary character and scientific excellence.

This refers also to the **reinforcement of international cooperation** – we believe that it will lead to improved quality of research through participation in international research networks and programmes.

The **establishment of research centres** and development of other forms of support for research teams and interdisciplinary research constitute a very important goal for Wroclaw University of Science and Technology. Activities of the centres are devoted not just to previously traditional studies at the University, but area also an expression of **expansion towards health and life sciences** and focus on priority research areas, with respect shown to the individual academic freedom.

Last year, we set up further centres which are to respond to key needs of Poland and the world. We have ambitious plans connected with the development of these centres. These are HealthTech Synergy Hub, Trusted Information and Telecommunication Systems Centre, Municipal Innovations Centre: Architecture, Engineering, Technologies, Mobility, Materials Engineering and Plastic Processing Centre, Innovation and Defence Technology Centre, Centre for Micro- and Nanoelectronics, Micro- and Nanosystems, and Micro- and Nanoengineering, as well Centre for Advanced Raw Material and Energy Technologies.

These activities are aimed at ensuring that Wroclaw University of Science and Technology has the status of a leading research centre in Poland and abroad, and also creating the best conditions for scientific development for its employees, PhD students, and undergraduate students.

Wroclaw University of Science and Technology is planning to still flexibly adapt its educational offer to the changing labour market needs and students' expectations.

The strategy for the next few years provides among other things for further development of interdisciplinary education. We are planning to also intensify activities connected with innovations and entrepreneurship, which may encompass creating new study subjects oriented on R&D, particularly in the context of information technologies, data science, artificial intelligence, and biomedical engineering.

We are counting mainly on the further strengthening of our partnerships through shared implementation of projects, including also those characterised by high risk due to the low level of TRL. Market conditions are very favourable because at the moment we have a large pool of funds to be used, including funds from the National Reconstruction Plan – involvement of our partners from the socio-economic environment already at the initial phases of innovation development always has a big value for our university. We would also like the business community to become more and more involved in the teaching process of our university.

We also appreciate the building of lasting relationships and partner networks which are necessary if we want to stand up together to global challenges that we are facing, such as climate change, dynamic development of the digital world, or population migrations. Local and regional authorities play an important role in the development of these partner networks, and we hugely appreciate their support and the shared efforts, knowing that this trio is a driver of modern economy and a guarantor of sustained development.

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The evaluation of the education potential of the university in the context of R&D cooperation is positive in general. 20% of respondents rate this potential as very good, and 45% – rather good. This means that 64% of firms in total perceive benefits arising from the cooperation with universities. Difficult to say or I have no opinion is indicated by 25% of respondents, which might suggest the need for more promotion and information about the cooperation opportunities. However, 8% rate the potential as rather bad, and 2% – very bad, which indicates areas in need of improvement.

These data show that the cooperation between firms and local universities in Wroclaw is well developed and diverse, although there are still opportunities for its intensification and expansion to cover new areas.

CHART 14.

Evaluation of the educational potential of universities in the context of R&D cooperation



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Every year, many patents and industrial designs are submitted, which constitutes evidence for the University's contribution to the development of innovations.

Anna Laskowska

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# Expert commentary

# dr Anna Laskowska

Director of the Research and Development Centre, University of Natural Sciences in Wroclaw

# Education: Fields of study and educational potential

The University of Natural Sciences in Wroclaw attaches huge importance to the education of specialists who are capable of meeting the requirements and expectations of the contemporary labour market including the research and development (R&D) sector. The University educates specialists with T-shaped skills, i.e. with deep knowledge of one subject and various skills enabling them to compete in the labour market in the research and development area. The didactic offer allows the expansion of competences to include soft skills, as well as practical aspects concerning entrepreneurship or technology development.

Education in the field of principles of cooperation with the socio-economic environment, protection of results of research and R&D work, as well as intellectual property, and research project management. Young scientists learn how to effectively write application projects and analyse the commercial potential of technologies developed.

Students have the opportunity to participate in international exchange programmes, such as Erasmus or NAWA (National Academic Exchange Academy), and cooperation under the EU Green alliance. The alliance comprises nine universities from European countries, making it possible for students and academics to develop their conferences and initiate scientific cooperation in the international environment. The participation in numerous study visits, internships and research stays both in Poland and abroad significantly expands the undergraduate and doctoral students' horizons significantly, preparing them for work in the R&D area.

# Cooperation with the business community

The University cooperates with the socio-economic environment with regard to their shared research, student placements, internships for researchers, as well as the implementation of shared non-profit undertakings. The contact with industry constitutes a very important and necessary element of the research and development strategy. Many research and development projects are conducted in cooperation with enterprises from Wroclaw and other regions, also from abroad, funded mainly by NCBR and the Polish Agency for Enterprise Development (PARP). These projects are aimed at developing innovative products and technologies for the economy and the society.

Besides projects with external subsidies, the University implements commercial research commissions, in particular for such industries as: bioeconomy, food technology, veterinary science and animal science, as well as agriculture and horticulture.

Moreover, the University of Natural Sciences of Wroclaw has the Innovative Technology Centre at its disposal – a complex of laboratories dedicated to the cooperation between science and industry. The cooperation with small and medium-sized enterprises in the Wroclaw region meets challenges connected with their ability to become involved in larger research and development projects. In response to these difficulties the University is seeking solutions which allow more effective cooperation, particularly in the context of availability of funds and financial support for the SME (small and medium-sized enterprises) sector.

Within the Wroclaw agglomeration, the University enters into around 20 agreements for the research service or an expert opinion with firms from the agglomeration.

These agreements refer mainly to agriculture and horticulture. The University also cooperates with the Medical University of Wroclaw with regard to food safety and under the shared initiative between the city and the University – Urban Farm in Swojec.

# The most important solutions from last 2 years:

- Application to track and predict the spread of infectious diseases among animals tested on wild boars and swine flu.
- 2. Prediction model for precise prediction of weather.
- Method for developing light maps to optimise urban lighting.
- 4. Peat substitute.
- 5. Device for testing dry fermentation under laboratory conditions.

### Scientific work and research

The University of Natural Sciences each year publishes a significant number of science papers reflecting the high level of work conducted. It is in the **first place in Poland in the field of Food Science & Technology of the Shanghai Ranking and in the second place in the industry index in the Veterinary Science field of THE WUR by subject ranking**.

Basic research constitutes the foundation for further application research which can potentially lead to the commercialisation of results. However, due to the need to protect intellectual property and to keep them confidential, the publications of results of application research are limited and require close cooperation with enterprises and the Technology Transfer Centre.

Every year, many patents and industrial designs are submitted, which constitutes evidence for the University's contribution to the development of innovations. The University is also involved in international research projects implemented in consortia with partners from different countries, which emphasises its role as a leading research institution in the region.

The University's offer includes also implementation doctorates funded by the Ministry of Education and Science. These programmes are intended for persons employed in firms which carry out scientific research in cooperation with the University and allow for direct application of research results in the economic practice.

- 105 research projects funded by the National Science Centre and the National Research and Development Centre for the total amount of PLN 13.3 million;
- 30 international projects under implementation for the total amount of ca. PLN 28 million, including Horizon 2020 and Horizon Europe

   ca. PLN 18 million, projects co-funded by NCN - ca. PLN 8 million and NCBR
   ca. PLN 5 million, other
   ca. PLN 10 million;
- 30 implementation PhDs under the Ministry of Education and Science (MEiN) programme "Implementation doctorate" for the total amount of PLN 9,751,430;
- Number of publications **876**, including in magazines awarded by JCR **688**;
- 20 invention projects notified to the Patent Office of the Republic of Poland,
   41 awarded patents for inventions,
   1 protection certificate for utility models;
- 11 projects implemented under European Structural Funds for the amount of over PLN 41.6 million;
- 13 projects for the total amount of PLN 6,523,000 and 145 agreements

with partnership universities under the Erasmus+ programme, and **7** projects for the total among of **PLN 7,289,272** under the **NAWA** programme;

• Subsidisation from the EU GREEN project for the amount of PLN 6,741,363.

#### **Development prospects**

The University of Natural Sciences in Wroclaw is part of the global academic community in main trends of research, didactic activities and cooperation with the environment. The strategy developed until 2030 defines the mission and determines the direction of the axiological basis for activities, having the education of human resources for the role of leaders of a modern society and economy in mind. In the next five years, there are plans to expand the educational offer, with greater involvement of entrepreneurs in the process of education that corresponds to the needs of the economy of the future through workshops, hackathons and educational programmes in which they play the role of mentors.

The support of local authorities in the creation of funding programmes that will allow effective cooperation between the business and the University for the region is of key importance.

The support of local authorities in the creation of funding programmes that will allow effective cooperation between the business and the University for the region is of key importance. It is expected that local authorities will support the creation of partnerships between the University the industry and institutions such as Wroclaw Technology Park, which will allow the scaling of innovative projects from the laboratory phase to semi-technical phase. A good start for this discussion was the meeting of scientific institutions with regional business under the shaping of Lower Silesian Intelligent Specialisations.

Further development of the University with regard to R&D is unavoidable, desired and expected. In the shorter perspective it will contribute to an increase in the competitiveness of enterprises benefitting from the opportunities offered by the University of Natural Sciences in Wroclaw and its academic staff. In the longer perspective, it will contribute to increasing the innovativeness of the Wroclaw region, and cooperation with business as well as development of educational programmes will bring benefits both to students and the academic team, and to the socio-economic environment.

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# 3.2. Wroclaw's relocation potential – analysis of the potential and attractiveness of the city

The attractiveness of the Wroclaw labour market is valued both by the students of local universities and by experienced specialists from other parts of the country.

Wroclaw has remained in the top cities which are the most attractive ones in terms of relocation, which can be described as first-choice locations (above 30% responses), for years next to Warsaw, Tricity, and Kraków. In 2023, 46% of specialists and managers indicated this city as attractive for relocation which indicates an increase in comparison with the previous year by 13 p.p.<sup>20</sup>

An increase in the percentage of students from abroad at Lower Silesian universities is also noticeable – in the years 2018 – 2022 this ratio increased by nearly 2 p.p. to 8.1%<sup>21</sup>. Students are attracted by the high quality of education, attractive programmes of studies offered in English, modern infrastructure and dynamic academic community, as well as extensive cultural offer and professional development opportunities in Wroclaw.

Wroclaw is a city which has a number of features that make it an attractive place for relocation for managers both from the Schengen zone and from outside of it. Its strategic location in the centre of Europe facilitates access to other main European cities and markets thanks to convenient air, rail and road connections. Wroclaw is characterised by a dynamic labour market, particularly in the IT, finance, and engineering sectors, which attracts numerous international corporations and startups, creating a rich professional community and many career opportunities. Employees are attracted among other things by Wroclaw's reputation as an innovation hub and the large availability of job offers for specialists.

<sup>20</sup> Activity of specialists and managers in the labour market 2023, Antal.

<sup>21</sup> Statistics Poland, Local Data Bank.

Nearly 120,000 foreigners are already working in the Lower Silesian voivodship, of which 91,500 are persons of Ukrainian nationality<sup>22</sup>. Foreigners constitute even up to 10% of IT employees in Wroclaw<sup>23</sup>.

The high quality of life in the capital of Lower Silesia includes the availability of modern housing, extensive cultural and entertainment offer, and abundance of green spaces. It is also deemed one of the safest cities in Poland. As the BEAS 2023 report - Wroclaw's Investment Potential, developed by Antal and Cushman and Wakefield – indicates, Wroclaw has been developing very dynamically in terms of cycling infrastructure. New cycle paths, bicycle rental shops, bicycle parking areas and other spaces friendly to this type of activity are constantly developed<sup>24</sup>. In the "Quality of Living" ranking published by the Mercer consulting firm, it was ranked 106<sup>th</sup> among 230 cities from all over the world, and has also been included in this ranking as a city developing into a business centre<sup>25</sup>. Wroclaw also came third after attracting the record number of projects in 2022 according to fDi Markets. Large investments in the fourth largest city in Poland came from the Japanese

company Hitachi, which opened a new office for its local branch, the Italian logistic company BCUBE, and the German company BSH AGD. The CEO of AirSlate from Boston, a platform for automation of document circulation, which recently opened a branch in Wroclaw, described the city as one of the "fastest developing technological, business and educational centres in the heart of Europe". Meanwhile, at the end of 2021, Richard Branson's Virgin Orbit invested in the Wroclaw manufacturer of nanosatellites – SatRevolution<sup>26</sup>.

Despite its growing popularity, Wroclaw still offers relatively affordable costs of living in comparison with other large European metropolises, which is important for managers looking after cost effectiveness. These factors make the city attractive to managers seeking new professional challenges and high quality of life, which causes it to be an excellent choice for relocation.

Based on the table presenting Wroclaw's features that are potentially attractive to foreign specialists, it is worth pointing to such aspects as **quality of life (62%) and professional opportunities (59%). Culture and entertainment (53%), security (50%), infrastructure (41%), education and schools (37%) and costs of living (34%)** also play an important role in decisions about relocation. Only 8% of respondents believe that Wroclaw is not attractive to foreign specialists, which demonstrates a generally positive perception of the city. Other features mentioned by **3% of respondents** encompass the location and

<sup>22</sup> ZUS (Social Insurance Institution), Number of insured persons who provided nationality other than Polish in the application for pension and disability pension insurance, by voivodship – status as of 30 June 2024 (foreign employees who are employed on the basis of contracts from which no compulsory contributions are paid to ZUS).

<sup>23</sup> Own study based on Linkedin.com [access: 30.07.2024].

<sup>24</sup> Wroclaw's Investment Potential, Survey by Antal and Cushman & Wakefield, BEAS 2023, 4th edition.

<sup>25</sup> Mercer, Quality of Living City Ranking 2023, https://www.mercer.com/insights/total-rewards/talent-mobilityinsights/quality-of-living-city-ranking/#city-ranking.

<sup>26</sup> fDi Intelligence, European Cities and Regions of the Future 2023.

proximity of the German border, international communities, green spaces in Wroclaw, as well as Polish employees' command of languages. The city attracts specialists and managers from different parts of the world thanks to its strategic location, dynamic labour market, high quality of life, and relatively low costs of living. The high percentage of foreigners working in Wroclaw, particularly in the IT sector, confirms that it is an excellent choice for professionals seeking new professional and life challenges.

## CHART 15. Wroclaw's features influencing its attractiveness to foreign specialists



Source: Surveys by ARAW and Antal, 2024

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For Google, Wroclaw's relocation potential is extremely important, because more than half of their local employees come from outside Poland.

Witold Wójtowicz

# Expert commentary

# Witold Wójtowicz

Head of Google Wroclaw, Head of gPS CEE, Google

For years Wroclaw has been in the lead among Polish cities in terms of investment attractiveness and residents' quality of life. These assets, well-known in Poland, are more and more often noticed by foreigners who readily settle in the capital of Lower Silesia, planning their professional future here. Wroclaw attracts people with its unique combination of history, culture and modernity. The charming architecture of the old town, numerous universities, parks and green spaces on rivers – these are just some of the assets which make our city so unique. Google discovered these advantages already 17 years ago and has been successfully developing its presence on River Oder.

In conversations with foreigners from our company, other merits of Wroclaw are often mentioned – ones that may be less obvious to its native residents. These include:

- security,
- extensive urban infrastructure,
- high availability of healthcare and advanced medical services,
- universal command of English and extensive educational offer in that language.

As a result of these factors, a relocation to Wroclaw often involves improved quality of life for foreign employees and their families, which increases the likelihood that they will choose to stay longer.

For Google, Wroclaw's relocation potential is extremely important, because more than half of their local employees come from outside Poland. Such diverse work environment not only has a beneficial impact on the atmosphere in the office, but also helps them create better products and solutions for users and clients all over the world. We have also noticed that foreigners become involved in supporting local communities with great passion, which helps them integrate further and get to know our culture more closely. All this is possible thanks to the openness of our city and its inhabitants. I am convinced that in the future the attractiveness of Wroclaw will continue to grow, and more and more specialists and managers from abroad will pick this city as their new home.

# 3.3. Wroclaw's ecosystem: functions and organisations supporting the development of R&D centres

Key roles in the ecosystem supporting R&D centres are played by such institutions as the Wroclaw Technology Park (WPT) and business incubators which offer modern infrastructure and specialist consultancy for firms and startups. Additionally, the city stands out due to its dynamically developing clusters which attract investments and talents from all over Poland and from abroad. Thanks to these elements Wroclaw is reinforcing its position as one of the leading innovation centres in Central and Eastern Europe.

Entities operating in the ecosystem ensure access to advanced scientific and research infrastructure and support necessary to conduct advanced research and innovations. Support centres offer modern laboratories, specialist equipment, and access to experts and specialists who help in innovation processes. The key research areas include IT, engineering, chemistry, pharmacy, biotechnology and nanotechnology. Important entities offering support include Łukasiewicz – PORT Research Network, Józef Kosacki Military Institute of Engineering Technology and numerous Wroclaw institutions, such as Wroclaw Technology Park, Wroclaw Technology Transfer Centre, Wroclaw University of Science and Technology, Silesian Piasts Medical University, University of Natural Sciences and Economic University.

The Wroclaw Agglomeration Development Agency (ARAW), in accordance with the analysis by Bobowski and Kuźmińska-Haberla, holds the function of the key coordinator and the ecosystem centre focused on R&D and startup development. The Agency's tasks include creating beneficial conditions for their development, attracting foreign investors to manufacturing and service sectors, supporting firms in the post-investment phase and creating new jobs. The Agency also works intensely on tightening cooperation between local governments through support for infrastructural, educational and promotional projects. Additionally, it conducts activities promoting brands, such as Invest in Wroclaw, Made in Wroclaw, Study in Wroclaw, Visit Wroclaw or wroclaw.pl<sup>27</sup>.

<sup>27</sup> Bobowski, S. and Kuźmińska-Haberla, A. (2002), Charakterystyka ekosystemu startupowego Wrocławia (Characteristics of the Wrocław startup ecosystem). [In:] A. Kuźmińska-Haberla, S. Bobowski (edit.), Rola ekosystemu w rozwoju startupów, Przypadek Wrocławia (Role of the ecosystem in the development of startups. The case of Wroclaw.) (p. 128-157), Publishing House of the Economic University in Wroclaw.

# Support centres /incubators:

## LOWER SILESIAN INNOVATION AND SCIENCE PARK (DOLNOŚLĄSKI PARK INNOWACJI I NAUKI)

DPIN is the so-called Business Environment Institution the main objective of which is the commercialisation of research and development activity. It deals with problems and implementation of innovative solutions and technologies in enterprises from Lower Silesia and beyond. The main areas of DPIN's activity are the technology park, offering support for businesses wishing to start cooperation with representatives of science to develop new technologies, the technology incubator for beginner firms from the SME sector, the business incubator addressed mainly to new enterprises, and EU projects - both their implementation and consulting for the preparation of the project and documentation.

As part of the development and commercialisation of the results of research and development work, we will find such services as manufacture of test batches of products intended for batch production, development of integrated IT systems, or preparation of construction prototypes.

#### NOKIA GARAGE

Place of exchange of knowledge, experience, ideas and know-how between the firm and its technological base (experts, technologies, knowledge) and young scientists, startups, cities and business partners.

# ŁUKASIEWICZ – PORT RESEARCH NETWORK POLISH TECHNOLOGY DEVELOPMENT CENTRE (SIEĆ BADAWCZA ŁUKASIEWICZ – PORT POLSKI OŚRODEK ROZWOJU TECHNOLOGII)

Łukasiewicz – PORT Research Network Polish Technology Development Centre develops new technologies to meet the needs of the industry. Scientific and research activity of the centre is focused around materials engineering and biotechnology. Łukasiewicz – PORT employs valued and ambitious scientists using the infrastructure of modern science and research laboratories and the assistance of a support team. The Institute supports the development of Polish firms and startups, such as XTPL or SensDx, and at the same time is a reliable and desirable partner for international corporations, such as Roche, Pfizer, Amgen or LG. Łukasiewicz – PORT. Polish Technology Development Centre is part of the Łukasiewicz Research Network, one of the largest science and research networks in Europe, uniting 22 institutes from all over Poland.

#### WROCLAW TECHNOLOGY PARK (WPT)

WPT is the key centre supporting R&D centres in Wroclaw. Over 220 businesses employing over 2000 people operate within its premises. The Park offers modern infrastructure encompassing over 66,000 square metres of office, laboratory as well as manufacturing and warehousing space. WPT also operates the Stellar Hub business development programme which offers a wide range of services, from letting of space, to business incubators, and finally to specialist consultancy and networking.

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Internationally, PORT participates in the prestigious Horizon Europe programmes, supporting the creation of interdisciplinary centres of excellence for precision medicine.



# Expert commentary

# prof. dr hab. Jarosław Bosy

Director of the Institute, Łukasiewicz Research Network – PORT Polish Center for Technology Development

Łukasiewicz Research Network – PORT Polish Center for Technology Development is part of the Łukasiewicz Research Network, one of Europe's leading research and science organisations. The network brings together over 20 institutes, conducts advanced research, and commercialises innovative solutions through the integration of science and industry, strengthening the Polish economy's competitiveness in the global market.

Wrocław-based Łukasiewicz - PORT is a powerhouse in biotechnology, material engineering, and medical diagnostics, developing breakthrough technologies in collaboration with domestic and foreign partners. A key element of PORT's activities is its cooperation with the medical, technical, scientific, and life sciences community. In an exciting development, PORT is planning to establish a BSL-3 laboratory to further enhance its infrastructure offerings.

Internationally, PORT participates in the prestigious Horizon Europe programmes, supporting the creation of interdisciplinary centres of excellence for precision medicine. These projects will create the International Research Agenda (MAB), which will stimulate innovation in oncology and neurology by integrating national and international research centres.

PORT is actively fostering regional partnerships, particularly in border regions, to support technology development. With its advanced infrastructure, skilled teams, and extensive international contacts, Łukasiewicz – PORT is an attractive partner for the local scientific and business communities, contributing to innovation and competitiveness in Lower Silesia. The Institute's goal is to become a leading R&D hub, providing world-class services and actively contributing to the region's innovation growth and global competitiveness.

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WPT also coordinates the NUTRIBIOMED cluster which has 118 member firms.



# Expert commentary

# Aneta Kawa

Director of the Department for Quality and Research Projects, Wroclaw Technology Park

Wroclaw Technology Park plays a key role in shaping Wroclaw as a research and development centre, building the R&D potential in the region. Thanks to the advanced structure and comprehensive support, WPT combines the world of science with business, offering assistance at each stage of the R&D process – from the concept to implementation.

WPT supports businesses in the development of new technologies, providing advice on optimisation of processes and marketing of innovations.

Around 180 entities operate in the Park and can benefit from the wide range of 14 advanced laboratories and prototyping shops, receiving support in the implementation of research and development projects dedicated to various fields, such as chemistry, bioengineering, electronics, mechanics or IT. Clients of the R&D Laboratory of the Experimental Institute include producers of food and dietary supplements who receive our help in formulating recipes.

Services provided to clients in the field of R&D services are: renting of the technology hall, ren-

ting of testing and experimental infrastructure, renting of technical infrastructure for conducting research, development work and innovation activity. The Park offers both rental of space and equipment, and performance of research services carried out by own specialists. WPT employees, among other things from the Department for Research and Development with the Experimental Institute, have extensive knowledge and experience, which enables them to implement complex R&D projects.

WPT also coordinates the NUTRIBIOMED cluster which has 118 member firms. The Park offers 66,000 square metres of office, laboratory, manufacturing and warehouse space adapted to the needs of enterprises.

Thanks to these activities, WPT is the place where innovations become reality.

#### **Business incubators**

Two incubators operate within WPT: **Lower Silesian Academic Business Incubator** and Integrational Business Incubator. They offer support for startups, ensuring infrastructure, consultancy and mentoring programmes. Additionally, the **WPT StartUp HUB** programme has been launched, addressed to startups from the research and development sector. Over 330 firms have already developed in the incubators, of which 80% managed to remain in the market.

# Clusters in the Lower Silesian voivodship

Clusters are groups of firms, research institutions and supporting organisations which cooperate in specific sectors of industry in order to jointly develop innovations and improve market competitiveness. Their main role is to facilitate knowledge and technology exchange, which speeds up research and development (R&D) processes and supports the development of new products and services. Various clusters supporting the development of technologies and innovations operate in the voivodship.

### LOWER SILESIAN AVIATION CLUSTER (DOLNOŚLĄSKI KLASTER LOTNICZY)

It is open to businesses and institutions operating in the aviation sector, supporting both the development of technology and cooperation between enterprises, universities and research centres. Thanks to shared activities, members of the cluster create favourable conditions for the development and establishing new firms in the aviation sector. Moreover, they raise the attractiveness of the region by promoting Polish aviation industry on the international arena, and they develop the research and innovation sector.

### LOWER SILESIAN EDUCATION CLUSTER (DOLNOŚLĄSKI KLASTER EDUKACYJNY)

It creates a new path for the development of industry and technical education, allowing cooperation between highly specialised and qualified staff which in future may have a significant impact on the region's economy. This project is aimed at creating a cluster which will permanently link Wroclaw secondary schools providing education in technical professions, including electrical and electronic, such as ones connected with electricity and energy, informatics and telecommunications, as well as mechatronics.

### LOWER SILESIAN AUTOMOTIVE CLUSTER (DOLNOŚLĄSKI KLASTER MOTORYZACYJNY)

It was established in order to increase the innovation potential of firms in the automotive sector, offering them access to modern technologies and extensive education base. The cluster supports innovations and cooperation in the industry, ensuring consultancy and access to advanced research and development infrastructure, as well as promoting knowledge transfer and exchange of experience.

# SPACE TECHNOLOGY CLUSTER (KLASTER TECHNOLOGII KOSMICZNYCH) – SILESIAN SPACE VALLEY

The purpose of the Space Technology Cluster is to bring together companies from the space sector and related industries, both in Poland, the European Union, and outside its borders, offering them possibilities of technological development. Its main goal is to increase innovativeness in the space sector in the south-west part of Poland through access to modern technologies, education, and through support for knowledge transfer and exchange of experience. The cluster also relies on effective linking of technological, scientific and educational potential, integrating entrepreneurs, science entities, and business environment institutions.

### WESTERN ELECTROMOBILITY CLUSTER (ZACHODNI KLASTER ELEKTROMOBILNOŚCI)

Its aim is to enhance innovation of automotive firms in south-west Poland through providing them with access to modern technologies, education, and knowledge transfer. The cluster focuses on the integration of enterprises from the electromobility industry and related sectors in Poland, the European Union, and outside its borders. Its priorities include development of electric vehicle technologies, construction of the charging infrastructure, increasing energy security, and reducing emissions connected with transport.

# WPT NUTRIBIOMED CLUSTER (KLASTER WPT NUTRIBIOMED)

The food-biotechnology-biomedicine cluster has been established by the Wroclaw Technology Park (Wrocławski Park Technologiczny SA) and involved experts. Its objective is to reinforce Poland's position in the sector of dietary supplements, nutraceutics, and biomedical preparations, using domestic raw materials and modern technologies. The cluster focuses on food processing, production of nutraceutics, biomedical preparations and biotechnologies, integrating modern technologies with the experience of its members. The cluster's activity also encompasses food preservation technologies and development of innovative bio-packaging systems.

# LOWER SILESIAN METAL CLUSTER (DOLNOŚLĄSKI KLASTER METALOWY)

It is a group of firms from the metal industry which cooperate with one another on various platforms, supported by scientific and research entities and business environment institutions. The member firms of the cluster are located in the Legnica-Glogow Copper District which is an example of a conurbation in the urban and industrial area of the Lower Silesian voivodship. This region, famous for its mining of copper deposits, concentrates its activities in mining and metallurgy, and is one of the largest copper mining centres in the world.

## "WALBRZYCH RAW MATERIALS" CLUSTER (KLASTER "WAŁBRZYSKIE SUROWCE")

The project entitled "Walbrzych raw materials cluster - raw materials for advanced material technologies" is addressed to the science and business communities, particularly in the Walbrzych Agglomeration, and its objective is to participate actively in the building and implementation of the regional intelligent specialisation in raw materials for advanced material technologies. The cluster's offer is addressed mainly to entrepreneurs from the mining and raw materials sectors, scientific institutions, research and development units, universities (in particular faculties of chemistry, energy, geology, chemical metallurgy, solid-state physics, and materials engineering) and to business support institutions.

### WALBRZYCH ENERGY CLUSTER (WAŁBRZYSKI KLASTER ENERGETYCZNY)

This is cooperation between local government units, research and science institutions, entrepreneurs and organisations supporting the development of renewable energy sources and promoting environmental protection. Its main goal is to establish an area that is self-sufficient in terms of energy, which effectively uses local renewable energy sources and high-efficiency production technologies. The cluster also aims at reducing the greenhouse gas emissions, supporting sustainable development of the economy.

### "INVEST IN EDU" EDUCATION CLUSTER

Its goal is to integrate economic, educational and scientific potential in order to adapt education better to the needs of the local labour market. It focuses on increasing the innovativeness of enterprises through cooperation with science and business, as well as transfer of knowledge and human capital. Its activities also encompass increasing the qualifications of future employees and promotion of vocational and technical education among pupils and their families. Currently, over 150 entities are members of the cluster, including entrepreneurs, primary and secondary schools, sectoral and technical schools, universities, as well as supporting and business environment institutions.

## ICT CLUSTER (COMMUNITY OF KNOWLEDGE AND INNOVATION FOR INFORMATION AND COMMUNICATION TECHNOLOGY)

This is a cooperation platform which brings together innovative ICT firms from Poland and Europe, institutions using information technologies, universities, specialist ICT schools, and regional authorities. Currently, it includes nearly 70 partners. The purpose of the ICT cluster is to synergically use competences as well as R&D potential of its members in order to jointly develop innovative solutions and apply for funds for their implementation. Additionally, the cluster is planning actions aimed at educating specialists in the latest information and communication technologies, responding to the needs of the economic sector.

# CINNOMATECH INNOVATIVE MANUFACTURING TECHNOLOGY CLUSTER (KLASTER INNOWACYJNYCH TECHNOLOGII W WYTWARZANIU "CINNOMATECH")

It focuses on supporting the economic development of the region and enhancing the competitiveness of enterprises in the manufacturing industry. Its mission is the integration of firms from Lower Silesia, mainly from the sectors of metalworking, machinery building and machinery parts, as well as production of machining tools. It also includes service institutions from various fields, such as education, research and development, finance, IT services, and consultancy. They offer support in the design of technological processes, selection of tools, and optimisation of electricity consumption, thus supporting the activity of firms that are members of the cluster.

### SOUTH-WESTERN ENERGY CLUSTER (POŁUDNIOWO-ZACHODNI KLASTER ENERGII)

Its goal is to enhance energy security and improve air quality in the region. The project focuses on local development, uses available energy sources, such as effective cogeneration and renewable sources. The activities of the cluster are adapted to specific needs of the region, which is to contribute to increasing economic effectiveness and environmental protection.



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An important thing is to continuously develop more and more effective partnerships at the intersection of science and business, but also administration.

Mateusz Jarzombek 🤅

# Expert commentary

# Mateusz Jarzombek

Director of the Businss Support Centre, Wroclaw Agglomeration Development Agency

The natural consequence of development of Wroclaw as an economic centre is the process of construction of an appropriate base to service its new, more specialised functions. This refers to both enterprises conducting R&D activities, research institutes, universities, incubators, and the entire startup market. All these entities create a system that is helpful at various stages of creating innovations. They benefit from the best scientific traditions of the city, at the same time developing modern practices. Cooperation between these environments, knowledge about what they have to offer, possibilities of support or potential to build partnership cannot be overestimated.

An ecosystem that is complete and cooperates internally is necessary for the development of innovations in the region.

This is the only way, by using rich HR resources and the mature business market, that we can achieve the ambition for Wroclaw to be not just a high-quality service provider but also a place where globally appreciated intellectual property is created. We have a good base to rely on – 30 universities, 18 business incubators, over 100 public and private R&D centres, the largest technology park in Poland, the most active startup ecosystem in the country according to the report by the Startup Poland Foundation, and thriving sectoral clusters all constitute excellent potential.

Wroclaw – also from the cultural and historical point of view – is focused on cooperation and it is worthwhile to reinforce this advantage.

An important thing is to continuously develop more and more effective partnerships at the intersection of science and business, but also administration. It is a self-regulating system that is perceived and reflected in the city and region development strategy. This cooperation covers also international partnership to an increasing extent, which is supported e.g. by the strategic location of the region near the border with Germany and Czechia. The ecosystem of institutions concentrated around innovations needs its drivers and integrators who will create platforms for the development of cooperation between individual players. The Wroclaw Agglomeration Development Agency definitely plays such a function, as do Polish and foreign chambers of commerce which operate dynamically in Lower Silesia.

# 3.4. Infrastructure: modern offices in Wroclaw

Wroclaw is the third largest city in Poland in terms of population. It is also an important business, technology, university and tourism centre. Around 10% of all resources of office space in Poland is located in Wroclaw. The growth of the office market in Wroclaw is driven by its strategic location, attractiveness of the city to investors, availability of qualified employees and the development potential in many sectors of the economy.

TABLE	16.		
Office	space	in	Wroclaw <sup>28</sup>

	Wroclaw
Total office space resources*	1 378 400
Supply**	32 300
Demand**	49 900
Available space*	251 500
Office space availability ratio*	<b>18,2</b> %
Rent rates for best office space in the city	EUR/sq.m./month 13.50-16.00

\*value at end of 2nd quarter 2024

\*\* summary value from the 1st and 2nd quarters of 2024

<sup>28</sup> Cushman & Wakefield, Q2 2024.

FIGURE 1. Heat map – existing space resources in Wroclaw (as of 2nd Q 2024)<sup>29</sup>



# Resources and supply of office space

In the second quarter of 2024, Wroclaw resources of modern office space amounted to 1.38 million square metres. This year, the market has already increased by around 32,000 square metres, whereas it is expected that 10,000 square metres more will be completed by the end of the year. The volume of investments completed after the pandemic is half that during the period of the greatest market expansion in the years 2015-2019. This is the consequence of a number of economic factors: general economic situation (including lower activity of tenants) and higher costs of construction and financing of real estate. Currently, slightly over 50,000 square metres of office space planned for completion in the years 2024-2025 is under construction. PART 3\_Potential of the Wroclaw market for the expansion of R&D



# CHART 17. Annual supply of office space in Wroclaw in the years 2010–2025 (sq.m.)<sup>30</sup>

# Availability of office space

In the first half of 2024, new supply of office space in Wroclaw slightly exceeded the value of absorption, allowing the vacancy level to be maintained at a value similar to the end of previous year (18.2%).

This year, the market has already increased by around 32,000 square metres, whereas it is expected that 10,000 square metres more will be completed by the end of the year. The volume of investments completed after the pandemic is half that during the period of the greatest market expansion in the years 2015-2019. This is the consequence of a number of economic factors: general economic situation

(including lower activity of tenants) and higher costs of construction and financing of real estate. Currently, slightly over 50,000 square metres of office space planned for completion in the years 2024-2025 is under construction.





### Demand for office space

# The tenant activity in 2023 was close to the highest historic results during the 2017 – 2018 period and was only 2% lower in relation to the record year 2017.

During the pandemic, the Wroclaw market showed a relatively good resilience because the activity of tenants increased (whereas other largest office markets in Poland recorded decreases at that time). Despite all this, the market was also affected by the consequences of the pandemic because the share of renegotiation agreements, caused by the cautious approach of firms to relocation, increased significantly in the structure of transactions, similarly to all markets in Poland. Currently, and in the following years, hybrid working and the related way offices are used will have a big impact on the volume of demand. Offices in central locations or with good transport links on the other hand will become even more important.



# CHART 19. Demand for office space in the years from 2010 to 1st half of 2024 (sq.m.)<sup>32</sup>

## **Rent rates**

In the second quarter of 2024, average rates for the best office spaces in Wroclaw oscillated between EUR 13.50 and EUR 16.00 /sq.m./ month. Which means that they increased by EUR 0.25/sq.m./month in comparison with the previous year. The location and standard of buildings constitute the most important factors influencing the price strategy of individual investments. In turn, projects under construction are still under the pressure of growing rents due to the higher costs of financing, construction and fitout of the investment.

### IT and R&D sector in Wroclaw

Firms from the IT sector, including those operating in the research and development sector, are the largest tenants of office space in regional cities, including Wroclaw. In the last 5 years, this sector accounted for renting of around 35% of all of the rented space in the city. In turn, other tenants accounting for the renting of large amount of space, came from the manufacturing and services sectors (14% of space rented each) and the financial sector -13%.

When analysing the location of firms from the IT+R&D sector, it may be stated that locations in the centre and its direct vicinity are the most popular ones, as are those in the north-western part of the city.

Firms from the IT+R&D sector are among the biggest large-scale tenants in Wroclaw – in the last 5 years tenants from this sector concluded 6 transactions for space of at least 10,000 square metres each. On the other hand, the number of transactions for 1,000 square metres with the participation of tenants from this sector exceeded 60 at the same time. The largest office tenants in Wroclaw in this sector include: Nokia, 3M Service Center, DXC Technology and Google.

# CHART 20. Tenant activity by sector in the years from (2019 to 1st half of 2024) (sq.m.)<sup>33</sup>



\*medical facilities

# FIGURE 2. Location of tenants from the IT+R&D industry<sup>34</sup>



33 Ibidem.

34 Ibidem.

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The capital of Lower Silesia remains one of the leaders among regional cities in the race to attract tenants, because it offers many best-quality facilities.

Marcin Siewierski

# Expert commentary

# Marcin Siewierski

Associate, Regional Head /Western Poland, Cushman & Wakefield

Over the last decade or two we have been observing a very dynamic growth of the modern office space volume in Wroclaw, and the additional catalyst for the large-scale development of the office market were the investments made by large international firms. Traditionally, tenants renting the largest amount of space in regional markets, also in Wroclaw, are firms from the broadly understood sector of modern business services.

The excellently developed infrastructure remains one of the most important factors attracting investors to Wroclaw. The city has convenient transport links, an airport, access to a network of motorways, and a continuously expanded network of rail links. Wroclaw is also one of the largest academic centres in Poland.

Good conditions for conducting business in Wroclaw have been noticed globally. In the prestigious ranking "European Cities & Regions of the Future 2022/23", prepared by "fDi Magazine" – a magazine from the Financial Times group, Wroclaw came first in the category of medium-sized cities in terms of business-friendly features, and third among all medium-sized cities.

The research and development sector is developing dynamically in Wroclaw, with strong emphasis on innovations and technologies. Many global firms set up their research and development centres there for various sectors, including IT, biotechnology, medical technologies, and other. The city is also home to many startups which are making a significant progress in their fields. The large student population ensures constant supply of talent for research and development activity. Universities and research institutions often cooperate with local firms, supporting innovation and development

Wroclaw research and development sector is dynamic and ready for further growth, driven by the combination of local talent, international investments, strong innovation culture, and access to excellent infrastructure.

The capital of Lower Silesia remains one of the leaders among regional cities in the race to attract tenants, because it offers many best--quality facilities. The relatively high ratio of the available office space exists both in the group of buildings that are no older than 3 years, and those aged 3-10 years. Thanks to this, tenants can improve the standard of their office while meeting the contemporary ESG requirements, but also avoid high costs of maintenance. The modern technical infrastructure and high standard also allow the reduction of the costs of relocation and fitout/adaptation of new offices to the tenants' requirements.

After nearly three years of combining remote and onsite work in the so-called hybrid model, tenants are capable today of estimating better how much space they actually need.

Firms more and more often downsize and reduce the space of their newly rented offices. Instead, the higher standard and better location become the main selection criteria. In the process of adaptation to the ESG regulation, businesses are looking for office property with green certificates or potential for ecological modernisations.

In the 2024 perspective, slight pressure on the growth of rent rates can be noticed. Higher costs of construction, fitout of space and financing of the investment still have a considerable impact on the rent policy in new buildings. In the existing office buildings, the amount of rents depends on the attractiveness of locations and the solutions used there, in particular with regard to ESG. However, considering the availability of the existing space, rent rates remain at a relatively stable level.

# 3.5. Main challenges and strengths facing the city in the context of the R&D expansion

Wroclaw stands out against other cities in Poland thanks to many factors which support the development of the research and development (R&D) activity. One of the main assets of the city is its high quality of life which attracts specialists from different industries. As much as 61% of respondents indicated that Wroclaw offers excellent living and work conditions. This comfort, however, may increase the financial expectations of candidates, which constitutes a challenge for 40% firms which must compete for the best talents in the dynamically expanding labour market. Wroclaw's strong academic base, appreciated by 54% of firms, ensures access to modern knowledge and well-educated graduates, which is of key importance for the development of innovations. However, despite this educational potential, some businesses (32%) still have to contend with the shortage of qualified employees. This situation may arise from the dynamic growth of the R&D sector which generates high demand for specialists, but also from the challenges connected with the integration of the academic world with the labour market, which is indicated by 14% of firms.

#### CHART 21.

#### Wroclaw's strengths contributing to the expansion of R&D in firms



The closeness of foreign markets, which is appreciated by 43% of respondents, makes Wroclaw an attractive place for businesses with an international reach. The geographic location of the city supports the cooperation with foreign partners, which is particularly important in the context of export and international development. At the same time, the volatile geopolitical situation may constitute a challenge for firms which have to flexibly adapt their strategies to external conditions, which is the case for 19% of them.

Wroclaw also offers a well-developed technological infrastructure, which was indicated by 40% of respondents as an important asset for the conducting of advanced research and development. Nevertheless, some firms (13%) notice shortcomings in the access to the latest technologies, which may restrict their ability to innovate. This shows that although technological base is solid, there is a need for further investments in the latest solutions.

Investment incentives, such as Polish Investment Zone, R&D centre support programmes, and access to subsidies and grants, constitute an additional factor supporting the R&D sector growth in Wroclaw, appreciated by 10% of firms. Despite this support, 21% of firms have reported difficulties in obtaining grants and subsidies, as well as problems with legal regulations which could make access to these resources difficult. This may indicate the need to simplify procedures and to increase the effectiveness of support mechanisms.

#### CHART 22.

### Main challenges in the expansion of the R&D activity in businesses in the Wroclaw agglomeration.



#### Source: Surveys by ARAW and Antal, 2024

Other challenges indicated by 5% of respondents include lack of infrastructure (e.g. expressways, commuter trains), high costs of living, no awareness in their company, problems with availability of places, location of the R&D department outside Wroclaw, low level of technical awareness among the top management personnel, fast pace of development in such areas as ML & Al, no willingness in firms to develop in Poland, risk aversion, and preference for tested projects, as well as challenges connected with remote working.
These data show that firms operating in the R&D area encounter a number of diverse challenges which can affect their ability to effectively conduct research and development activity. Resolution of these problems will be key for further development of the R&D sector in the region.

To sum up the above data, Wroclaw offers a wide range of benefits for businesses conducting research and development activity, including high quality of life, strong universities, access to qualified employees and good technological infrastructure. The closeness of foreign markets and educational potential additionally increase the attractiveness of the city as a R&D centre. 109

Let us remember that it is the choice of location that often initiates the investors' decision-making process.

Tomasz Wroński

# Expert commentary

### Tomasz Wroński

Head of R&D Center Wroclaw, Viessmann Climate Solutions

Wroclaw is truly a place which constitutes a strong asset for us in building an R&D centre. Let us remember that it is the choice of location that often initiates the investors' decision--making process. Our city is home to many universities that enjoy an excellent reputation in Poland, and on top of this these are establishments offering a high level of education and their graduates are young people who are mostly ready to start work even in an R&D centre. The competition in the local labour market may seem a challenge, but for us this was a positive factor which provided us with access to experienced experts in many areas.

Another important elements which helped us build and develop our Centre were various types of grants and subsidies.

We live in a global village, we are often dealing with competition between locations from different corners of the world, thus cost attractiveness is and will continue to be an important decision-making parameter. And this leads us to the greatest challenge on the path of development of our team. Increased financial requirements made by employees in a competitive labour market lead to growing costs of operation of a research and development entity, and this may constitute a challenge in obtaining new projects in international corporations. The most important factor behind our team's success is the well-motivated, highly qualified team, full of ideas and willingness to continue creating, which may be scaled in many dimensions thanks to the favourable eco system.

### 3.5.1. Protection of R&D results from competitors

The analysis of methods of protection of results of research and development (R&D) work against competitors shows that businesses adopt various strategies in order to protect their innovations and knowledge.

Non-disclosure agreements (NDA) are the most frequently used protection measure used by 86% of firms. These agreements ensure that all information disclosed remains confidential and is not used by third parties without consent. Technical measures, such as encryption of information, protection of hardware, and limiting access to data and buildings are used by 74% of firms.

These agreements ensure that all information disclosed remains confidential and is not used by third parties without consent.

Technical measures, such as encryption of information, protection of hardware, and limiting access to data and buildings are used by 74% of firms. These activities are aimed at protecting information against unauthorised access and theft. Protection of intellectual property (IP) rights, including patent applications and design notifications, has been practiced by 56% of respondents. Patents and designs protect unique technical solutions as well as designs against copying by competitors. Copyright transfer agreements, used by 54% firms, ensure that rights to results of the R&D works remain in the hands of the company, even if the work is being carried out by external contractors or workers.

#### Only 3% of firms do not undertake any actions in order to protect the R&D results against competitors.

These data show that the majority of firms conducting R&D activity in Wroclaw attach great importance to the protection of their innovations and knowledge against competitors, using both legal and technical measures to achieve this. The implementation of effective protection strategies is key for the maintenance of the competitive advantage and further technological development.

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#### CHART 23. Methods of protecting results of the R&D work against competitors



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Patent searches carried out before the commencement or regularly during the R&D work help steer the activities in a safe direction.

Agnieszka Musiał

# Expert commentary

#### Agnieszka Musiał

Patent Attorney, Head of IP, Dotlaw

One of the basic questions are worth asking when commencing the R&D work is whether what we want to work on has not already been created. Finding an answer to this question enables us to save time, money and to create an effective plan of action.

### The assistance in getting that answer is offered by the patent search activities.

Patent search is a collective name for many types of research activities aimed at finding the features of a given technology in publicly available documents – patent information, scientific publications, but not only. Goals and results of search vary – from the general competitor and technology field check to the detailed assessment of risk of infringement on someone's exclusive rights. All these have, however, the same main objective: finding out what others have done before us.

Patent searches carried out before the commencement or regularly during the R&D work help steer the activities in a safe direction. Inventors find out which elements of their work already exist – they avoid "reinventing the wheel" and potential infringement of third party rights. As a result, patent searches enable inventors to achieve truly unique, previously unknown results. Patent search and watch can support the R&D work at every stage and, in consequence, facilitate effective protection and commercialisation of the results.

What is more, such activities are still not generally applied in Poland – only 56% of respondents of our survey answered that they protected their results using exclusive rights at all, and probably only even less conduct any type of search beforehand. Regular search may therefore also give competitive advantage over those who do not carry it out. One should remember, however, that research is never exhaustive, and excessive knowledge may become a problem in disputes – this is why it is worth having a sound patent search strategy, tailored for the specific field, embedded in the R&D plans.

Otherwise, it may turn out that protection and commercialisation of results of the R&D activities is impossible because the exact same thing has been already protected by someone else.

### To avoid disappointment – get the search done!



PART 4

# Development perspective: Wroclaaw as the R&D bubble bubble

### 4.1 City development strategy broken down into short- and long-term plans

The strategy of development of the city of Wroclaw, contained in the "Wroclaw Strategy 2030", among the three main directions of the city's development also provides for that connected with the R&D sector<sup>35</sup>:

- Central Europe's Silicon Valley: a city with programmer and conceptual base for public e-services, with prototype implementations in Wroclaw itself. Optionally: also a research and development base for the technological advanced defence industry.
- Creative and innovative economy linked with science: we want Wroclaw to be a city of strong schools and universities, thriving startups and the e-service hub for entire Lower Silesia! Our strategy is consistent with The Wroclaw Educational Strategy of 2015 – its key values are openness and creativity as well as commitment and development.

### As regards creative and innovative economy linked with science:

- Support for the development of high technology startups, raising competences and educating people from different age groups.
- Shaping the intelligent specialisation of the city around creative industries.
- Reinforcing Wroclaw's position as a regional centre of public e-services.
- Creating the brand of a creative nd innovative city.
- Promotion of Wroclaw among global investors and capital institutions.

The city is on the home straight of building "Wroclaw Strategy 2050" which emphasises even more the importance of R&D in the broadly understood socio-economic development.

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<sup>35</sup> Wroclaw Strategy 2030.

#### Development opportunities for the R&D activity in the coming years

Firms operating in the research and development (R&D) sector perceive many development opportunities which in the next few years may have a considerable impact on their activity and competitiveness.

The development of digital technologies constitutes the greatest opportunity indicated by 56% of respondents. Digitalisation allows the introduction of modern, innovative solutions which increase effectiveness and allow the creation of breakthrough products. Another important opportunity is the increased demand for R&D products and services indicated by 50% of firms. The growing demand for innovations creates new business opportunities, which makes it possible for businesses to respond to market needs and provide novel solutions.

The development of international cooperation is important for 42% of enterprises. Global partnerships speed up the transfer of technology and knowledge, at the same time opening new selling markets, which contributes to even greater innovativeness and competitiveness. Foreign investments, indicated by 39% of respondents, are the key developmental factor. Foreign funds may finance the research and development infrastructure and innovative projects, bringing at the same time new perspectives and experiences. New programmes supporting innovations (30%) and reorganisation in the firm (29%) also play an important role. These programmes provide financial and substantive support, whereas internal reorganisations improve the processes and operating effectiveness. The development of startups, believed to be an opportunity by 22% of respondents, point to the importance of young, dynamic firms in the R&D ecosystem. Startups introduce new technologies and business models, stimulating development and innovations.

The concentration of services indicated by 14% of firms shows that specialization and integration of specific functions may increase effectiveness and better resource utilization. Focusing on the key areas of operations may bring benefits in the form of more concentrated research and development activities.

Firms see many opportunities for development in the next few years, including the development of digital technologies, growing demand for innovations, international cooperation and foreign investments. Investment support programmes, internal reorganisations, development of startups and concentration of services are also important, as they enable the businesses to maintain competitiveness and dynamically develop the activity in the R&D sector.

#### CHART 24. Development opportunities for the R&D activity in the coming years



Source: Surveys by ARAW and Antal, 2024



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We are trying to ensure that entrepreneurs have access to global knowledge resources and financial instruments, using among other things the EU funding.

Magdalena Okulowska

# Expert commentary

dr Magdalena Okulowska

#### CEO, Wroclaw Agglomeration Development Agency

The dynamically changing economic and social environment creates new opportunities of development for enterprises, including in the R&D sector. As the survey results show, business realises this and knows where to turn its attention in order to use such opportunities. Our task as a city is to support this process – not just through enhancing the attractiveness of Wroclaw, improving the quality of life or development of infrastructure, but also building such a system of institutions and programmes so that entrepreneurs have an increasingly easier access to the city's full potential.

In Wroclaw we have been doing it for years – among the first ones in Poland we have created an entity responsible for acquiring foreign investors (ARAW), and we have also created a platform for cooperation on the city – business – science line (Wroclaw Academic Centre). From a developing city we have become an economic centre leading on the national scale, with the largest number of R&D firms and startups, knowledge process outsourcing centres, innovative industry, and a valued educational and HR base.

Today these activities gain even more in importance. The rapid development of technology and competition force the firms to build advantages through innovations. The city, as a good place to live, plays a significant role in this setup. The specialists of today are not only looking for just work but also for comfortable space to satisfy both basic and higher needs. The policy of public space improvement, sustainable building or making the city more green, as well as the extensive leisure offer constitute the priority of the current authorities, definitely following the future trends.

The awareness at which moment of development we are and where we are going is extremely important.

We know at the same time that, comparing ourselves with the most thriving economies of Europe, we have things to work on – especially with regard to the cooperation between industry and the science sector, or increasing expenditure on research and development. We are trying to ensure that entrepreneurs have access to global knowledge resources and financial instruments, using among other things the EU funding. We place an emphasis on acquiring players with the innovation potential in production, we have been developing the startup support system and we are creating a cooperation platform for various communities building Wroclaw's potential on the daily basis.

### 4.2. Investment support for R&D centres

Within the territory of Wroclaw and the entire region, investors may benefit from the broad range of supporting tools, including tax reliefs, grants, and programmes dedicated to the development of research and development (R&D) centres. These are government, regional or municipal programmes.

#### Polish Investment Zone (PSI)

Polish Investment Zone (PSI) constitutes an important element of support. Thanks to PSI entrepreneurs can obtain a tax relief for the implementation of new investments throughout Poland, regardless of the size of the business. This programme supports first and foremost companies whose activity includes IT, modern business services, and research and development (R&D) work.

Under the PSI programme, Special Economic Zones (ZES) managed by appointed companies offer additional investment benefits. Lower Silesia stands out due to its largest and thriving SEZ, including:

- Walbrzych SSE https://invest-park.com.pl/
- Legnicka SSE https://lsse.eu/
- Kamienna Góra SSE http://ssemp.pl/

They offer preferential terms of operation to entrepreneurs, including tax reliefs and other forms of support which additionally increase the investment attractiveness of the region. Moreover, the zones create conditions promoting the initiation of business relationships and combination of the economic, educational and scientific potential. Companies regularly organise meetings, workshops, training sessions and conferences.

#### **IP Box**

The IP Box relief, also known as Innovation Box or Patent Box, is a tax measure addressed to taxpayers who conduct research and development (R&D) activity. It allows preferential tax treatment of income acquired from intellectual property rights (e.g. patents, software copyright), which are legally protected and have been created, extended or improved under the taxpayer's R&D activity. In the case where a firm in Poland generates profits from its own intellectual property, they are taxed with a rate of just 5 percent.

#### **R&D** relief

Additionally, in January 2022, The Polish Deal allowed IP Box to be used together with the R&D relief. All entrepreneurs, independently of the business they owned, who conduct research and development activity, may benefit from an additional deduction from the tax base in the amount of 100% of eligible costs. In the case of taxpayers with the status of a research and development centre, the amount of deductions may reach even up to 150% of eligible costs. The relief for the research and development activity consist in the possibility of deducting expenses connected with the conducting of research and development work from the tax base. Costs connected with the conducting of research and development work listed in the Personal Income Tax Act or the Corporate Income Tax Act are subject to deducing.

#### **Relief for innovative employees**

This is one of the forms of tax support provided for by the Polish legislator. For developing firms, it is becoming an increasingly popular solution supporting the employment of innovative employees. Additionally, it is worth noting that this relief is strictly linked to the R&D relief. The condition for using it is to first benefit from the R&D relief. The preference is addressed to entrepreneurs who incurred a loss in the tax year or in the case where their amount of income generated does not allow them to deduct eligible costs under the R&D relief.

In accordance with the structure of this relief, firms benefitting from preferences connected with the research and development activity, who are payers of income tax, have the right to reduce advances on tax deducted from income from employment or provision of services under a contract of mandate or a fixed work contract in the case where the employee/service provider is directly involved in the R&D activity and where the working time allocated to the performance of the R&D activity or time allocated to the provision of the service concerning R&D activity is at least 50% of the general time of performance of work/ provision of service.

#### **Prototype relief**

Prototype relief consists in the possibility of additionally deducting 30% of deductible expenses linked to test production and marketing a new product from the tax base. This relief will help produce a prototype and then introduce an invention into production more cheaply.

#### **Research and development centres:**

An entrepreneur who is not a research institute, conducting research or development work, may be awarded the status of a research and development centre. The status entitles them to benefit from various reliefs, including the possibility of deducing up to 200% of deductible expenses incurred on research and development activity from the tax base. Research and development centres are also able to get an exemption based on the de minimis aid in the real estate tax and agricultural and forest tax.

"SMART Path" Programme of Polish Agency for Enterprise Development (PARP) (under the funds from the "Horizon Europe" programme): Developing and enhancing research and innovation capabilities of enterprises, oriented on the implementation of product or process innovations, as well as digitalisation and transformation of enterprises towards sustainable development, as well as internationalisation of enterprises and raising personnel's competences. Only micro- small- and medium-sized entrepreneurs who conduct business activity within the territory of Poland may apply for the funding.

A project may be composed of maximum seven different modules. Modules within a project may be implemented in a linear way (the implementation of a given module is the continuation of another one), or non-linear way (modules implemented independently). The support under the SMART Path may be provided for the implementation of projects encompassing:

- conducting of research and development work,
- implementation of results of R&D work,
- expansion of research infrastructure,
- digital or green transformation of the enterprise,

• internationalisation of the enterprise and raising personnel's competences.

#### **Voucher for innovations**

These were grants for SMEs from Lower Silesia used for R&D work for businesses (developing a new product, service, production technology). Vouchers worth up to PLN 200,000 were awarded. Firms performed research services at universities and in certified research entities. The topics of work carried out had to match Lower Silesian intelligent specialisations: chemistry and medicine, Auto-Moto-Aero-Space, natural and recycled resources, machinery and equipment, Green Deal, industry 4.0, technology-supported life. In total, under the edition in which the programme operator was the Wroclaw Agglomeration Development Agency, vouchers worth in total PLN 4 million were awarded to 22 firms. The funds came from the EU, under the Lower Silesia Regional Operating Programme (ROP) for 2014-2020.

### Real estate tax exemption within the territory of Wroclaw:

In accordance with Resolution No. XLVI/1191/21 of the Wroclaw Municipal Council of 25 November 2021, amending Resolution No. LXIV/1642/14 of the Wroclaw Municipal Council concerning real estate tax exemptions with regard to regional investment aid under the EIT+ programme for support of new investments for innovative entrepreneurs or ones who conduct research and development activity within the boundaries of Wroclaw (Voivodship Official Journal 2021.5739, published: 07.12.2021), real estate mentioned in §7, owned by innovative entrepreneurs or ones who conduct research and development activity within the boundaries of Wroclaw are exempted from real estate tax under the regional investment aid for support of new investments.

§ 7 of this Resolution contains detailed guidelines which must be met to apply for the real estate tax exemption. In accordance with it, up to 50 sq.m. of usable area of buildings or its parts occupied to conduct research and development activity or to conduct business activity connected with the implementation of new technology by the entrepreneur and launching on this basis the production of new or much improved goods, processed and services. The condition for obtaining the exemption is that expenditures on a new investment are incurred in the amount of at least PLN 5,000. For each further PLN 5,000 invested, up to 50 sq.m. of usable area of buildings or their part will be additionally exempted.

The exemptions period is:

- 5 years if the value of the investment was lower than or equal to PLN 2 million;
- 10 years if the value of the investment exceeded PLN 2 million and was lower than or equal to PLN 6 million;
- 15 years if the value of the investment exceeded PLN 6 million.

The exemption is awarded from the 1st day of the month following the month in which the Mayor of Wroclaw confirms that the entrepreneur has met the conditions to receive public aid pursuant to the Resolution. In the case where a new building has been built, the exemption is awarded from 1st January of the year following the year in which the construction was completed or in which the building started to be actually used.

#### **MOZART Programme**

"MOZART" Municipal Programme of Support for Partnership of Higher Education and Science and the Business Activity Sector. The main goal of establishment of this programme is to reinforce the Wroclaw labour market through the synergy between Wroclaw business and scientific capital. Under the project, the city provides financial support for science and business partnerships which implement projects in such fields as biotechnology, medicine, construction, IT, robotics and other. Firms participating in the programme may benefit from the knowledge and skills of scientists who in turn come into their own in the practical business environment. The programme is conducted by the Wroclaw Academic Centre. It plays the role of a link between the city's local government and the academic community. It is an innovative solution that is unique on the national scale

#### **Student Scholarship Programme:**

Wroclaw authorities continue to stimulate the local ecosystem, organise a number of diverse events aimed at creating space for networking, exchange of experiences, initiating relationships and cooperation. Together with all stakeholder groups, they also create a dynamic community which integrates small and large businesses, connecting them with the academic community, business environment institutions, startups, as well as the international business circles. At the same time, in Wroclaw entrepreneurs may count on support in informational activities, which helps to settle their firm in the region and present it to the local community. One of the examples of a campaign implemented in Wroclaw is "STEM - calculate your future", whose objective is to encourage youth and their parents to more often choose science-related subjects. Good practices presented by firms participating in the campaign: 3M, Amazon and BASF Govecs, Collins Aerospace or GKN Automotive show how many professional opportunities are provided by STEM.

The data presented in the table below show various approaches which local government institutions may adopt in order to effectively support research and development centres. The promotion of intersectoral cooperation has gained the most support, which is believed to be key for the stimulation of innovation by 61% respondents. Such activity allows better coordination among academic entities, the industry and local government institutions, which in turn translates into quicker implementation of new solutions on the market.

Also the financing of R&D projects through grants and subsidies is perceived as important by 57% of the survey participants, which underscores the need for direct financial support for research initiatives. Moreover, the organisation of meetings, conferences and trade fairs, which support the exchange of knowledge and experiences, has gained the support of 47% of respondents. These events facilitate networking, which is invaluable in the acceleration of technology and knowledge transfer between various players on the market.

The investment in technology infrastructure, such as technology parks and business incubators, which have been deemed important by 46% of respondents, points to the necessity of creating appropriate conditions for the conducting of advanced research and development by startups. These environments ensure not just resources but also access to the latest technologies and cooperation with other firms and researchers.

Respondents, when asked about additional activity of the local government, in appreciation of the R&D market size, pointed to the areas for development and increasingly effective activity of the local government.

#### CHART 25.

### Activities which should be undertaken by local government institutions in order to effectively support research and development (R&D) centres



Additional suggestions provided by respondents in the "Other" section include: improvement of public transport and road infrastructure, reduction of red tape, as well as specific incentives, such as availability of premises on favourable price terms or sale of land for the construction of R&D facilities with various tax reliefs.

These proposals show that respondents see that R&D should be supported not just through direct financial or infrastructural measures, but also through the creation of a favourable regulatory environment and living conditions.

The emphasis placed by some respondents on the importance of the quality of life in the city and the appropriate level of remuneration indicates the need for a holistic approach to the R&D support policy, where not just direct support for research centres themselves is important, but also the concern for researchers' and scientists' living and working conditions. 129

## 4.3. Wroclaw's place in international rankings

This subchapter will discuss Wroclaw's place in international ranking, analysing its position in different categories, such as human capital, lifestyle, business-friendly approach, or economic potential. It is also worth looking at greenfield-type investments, quality of life, and global economic importance of the city, which is confirmed by numerous honourable mentions in prestigious reports and listings.

In this year's "fDi" ranking "European Cities & Regions of the Future" <sup>36</sup>, Wroclaw came first in the medium-sized city category. According to fDi Markets' data, last year was a record one for the greenfield-type projects in Wroclaw, and the estimated investment expenditure amounted to USD 5.3 billion.

Wroclaw also had high ratings in subcategories – 1<sup>st</sup> place as regards human capital and lifestyle, as well as business-friendly approach, and 4<sup>th</sup> place in the category of economic potential.

The quality of living ranking prepared by the international consulting agency Mercer, Wroclaw was in the 106<sup>th</sup> place among cities from all over the world due to its highly qualified resource of specialists and developed infrastructure<sup>37</sup>.

Wroclaw was also the highest classified non-capital city of Central Europe in the global ranking Globalization and World Cities prepared by the British Loughborough University. The publication shows metropolises of the greatest economic importance, with London and New York at the top. As the ranking organisers emphasise, the listing contains the largest cities that have the best links to the world and are the most developed, and which play a dominant function in their own country. These are places of the highest relevance for the world economy, with the best predispositions for establishing international institutions, offices of large firms and organisations. Each year the ranking is based on the classification of cities in the world economy on the basis of advanced business services, including financial, accounting, consulting, legal and advertising services<sup>38</sup>.

Wroclaw, together with Warsaw, found itself among the one hundred most intelligent cities of the world in the IESE Cities in Motion Index ranking prepared by IESE Business School, one

37 Mercer Consulting Agency, Quality of Living City Ranking 2023,

<sup>36</sup> European Cities and Regions of the Future 2024, "The Financial Times".

https://www.mercer.com/insights/total-rewards/talent-mobility-insights/quality-of-living-city-ranking/.

of the best business schools in the world. The city receives the highest scores in the category "urban planning" (25th place), "governance" (78th place) and "human resources" (80th place).

Wroclaw is also the Polish capital of startups. Lower Silesia for the second time in a row has turned out to be the place where the largest number of young technological firms registered for business in Poland, i.e. 28%. For comparison, Warsaw and Mazovia are home to just 19% of all Polish startups. These are data from the "Polish Startups 2023" report prepared by Startup Poland<sup>39</sup>.

The "Investment potential of Polish cities" report prepared by Antal and Cushman and Wakefield, Wroclaw received the second highest average general score as regards the city, office space, and business potential, and it received the highest average score in the category of educational potential and employment potential<sup>40</sup>.

Wroclaw constantly reinforces its position on the international arena, achieving high places in rankings such as fDi European Cities & Regions of the Future, Mercer, Eurostat, Globalization and World Cities and IESE Cities in Motion Index. The city was in the lead among Polish cities in the category of rising stars of technology hubs in the report entitled "The next generation of tech ecosystems", prepared by Dealroom. The capital of Lower Silesia came second in this category in Europe and eight worldwide, which indicates unequivocally that it is an excellent place to set up startups and develop innovations<sup>41</sup>. Thanks to strategic investments, high quality of life, developed infrastructure and dynamic labour market, the city attracts the attention of investors and specialists from all over the world. These achievements constitute proof of Wroclaw's growing importance as a key innovation and entrepreneurship hub in Central Europe.

39 Ibidem.

<sup>40</sup> Investment potential of Polish cities – Wroclaw 2024, Antal and Cushman & Wakefield, https://investmentpotential.pl/wroclaw/.

<sup>41</sup> Dealroom, The next generation of tech ecosystems, December 2022.

## 4.4. Specialist personnel and costs of employment in the R&D area: analysis of Wroclaw and selected European cities

In Wroclaw itself and in its surroundings, around 60,000 IT specialists and 35,000 engineers are employed, which creates solid foundations for the R&D sector. The region stands out due to its particular wealth in the area of key competences for the research and development centres. The specialisations available include specialists dealing with, among other things, IoT (24,000), industrial automation (6,800) and embedded technology (22,000). This diversity of competences highlights Wroclaw's attractiveness as a place favourable for innovations and development of advanced technologies.

#### CHART 26.

Number of specialists and managers in Wroclaw and surrounding areas broken down by competences attractive for R&D centres<sup>42</sup>



<sup>42</sup> Linkedin.com [access: 30.07.2024].



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Creating the whole ecosystem supporting the development of R&D centres provides further opportunities for the Wroclaw agglomeration and its residents.

Joanna Wróbel

# Expert commentary

#### Joanna Wróbel

Team Leader, Antal IT Services

There is such a term in IT as orchestration, which for me means efficient coordination of many IT tasks in order to automate processes. In the Wroclaw agglomeration I have noticed efficient management of many areas in order to create environment that is convenient for development of business in several sectors, including IT, industrial engineering, industry and services. Development on the business plane also directly translates to the improved living conditions of that city's residents.

In this case, this is not a lucky coincidence, but wise actions undertaken by the city authorities and institutions supporting them with regard to implementation of developmental plans. In the agglomeration development planning, emphasis has been placed on those sectors which historically had always fared well in this city, which provided foundations for reinforcing the city's strengths and specialisations in individual professional groups. People are the most important ingredient, and the city has focused on development of higher education, maintenance and development of professional specialisations, but also retaining those who had come to Wroclaw to study.

In Wroclaw we can notice the effects of accumulation in given professions, which is the outcome of the stable development of the city in the long term. If we analyse the last 20 years, we can see continuous development of business in the form of new firms, development of existing business entities in the Wroclaw agglomeration, and business cooperation on the local and international scale. This accumulation creates excellent conditions for building expert competences in various fields.

R&D centres with emphasis on research have been developing steadily because they have the sufficient number of specialists with appropriate competences. In comparison with other cities in Poland, Wroclaw attracts IT firms which need experienced embedded programmers (knowledge of C/C++), IoT and with regard to other object languages, including Java, .NET, process automation in IT (min. CI/CD, change, version, configuration management), with regard to cybersecurity, AI, databases, industrial automation, and robotisation.

Talent pool in the Wroclaw agglomeration has additionally been achieved thanks to the flexible approach to work organisation in the form of hybrid and/or remote working as well as political and economic situation in Eastern Europe. An attractive city, and Wroclaw is one, encourages people to relocate, also from Western Europe. The development of urban infrastructure creates the feeling of closeness and encourages specialists to make a decision to change their place of residence. Creating the whole ecosystem supporting the development of centres provides further opportunities for the Wroclaw agglomeration and its residents. Wroclaw stands out as one of the most attractive cities in Central and Eastern Europe for businesses conducting research and development (R&D) activity, thanks to its strong talent pool of qualified specialists. The city and its surrounding areas are home to over 60,000 IT specialists and 35,000 engineers, which makes Wroclaw an important technology centre in the region. In comparison with other European capitals, such as Prague or Budapest, the number of available employees is competitive, and the remote work trend has additionally expanded the talent base which may be used by businesses operating in the city. Poland has also be awarded for the high quality of its specialists. As much as 70% of engineers and IT specialists in Wroclaw are persons with more than five years of experience, which constitutes the evidence of their sizeable expert knowledge and practical skills. In the global context, Polish programmers have come 7<sup>th</sup> in the world developer ranking according to the Pentalog report<sup>43</sup>, before such countries as France and Belgium. This high rating shows that Polish IT specialists are not just numerous but also highly appreciated in the international arena.

#### table 27.

Comparison of the number of employees in selected specialisations against other European cities<sup>44</sup>

	Wroclaw	Prague	Budapest	Bratislava
Total population number	674 132	1 294 513	1 749 734	429 564
ІТ	63 963	108 515	105 159	35 760
Engineering	35 603	41 340	47 577	11 825
юТ	24 018	42 808	32 713	11 066
Industrial automation	6 783	8 164	17 926	2 647
Embedded technology	22 000	32 749	35 284	8 388

Costs of employment in Poland, and thus also in Wroclaw, are relatively low compared to other European Union countries, which makes this city even more attractive to investors. **Average costs** of employment per hour in Poland amount to EUR 14.50, whereas in Germany as much as EUR 41.30, and in Czechia – PLN 18.00. Thanks to this Wroclaw offers not only highly qualified personnel but also competitive cost.

<sup>43</sup> Pentalog, Where are the World's Best Developers?

https://www.pentalog.com/blog/it-outsourcing/best-developers-in-the-world-pentalog-report/ [access: 05.08.2024].

<sup>44</sup> Linkedin.com [access: 30.07.2024].

#### TABLE 28. Economic indexes and employment conditions in selected countries<sup>45</sup>

Country	Rate of em- ployment (%)	Registered unemploy- ment [%]	Minimum wage [EUR]	Costs of employment pay per hour [EUR]	Employer's expen- ses other than employee's gross pay [% of pay]	Inflation level (%)
UE (27 coun- tries)	75.3%	6.1%	-	31.80	24.7%	2.6%
Bulgaria	78.1%	<b>4.7</b> %	477.04	9.30	13.3%	2.8%
Czechia	81.8%	<b>2.7</b> %	755.24	18.00	24.5%	2.2%
Germany	81.4%	3.3%	2054.00	41.30	23.4%	2.5%
Hungary	80.6%	4.4%	675.27	12.80	13.9%	3.6%
Poland	77.6%	3.0%	997.91	14.50	18.1%	2.9%
Romania	68.5%	5.2%	743.37	11.00	5.0%	5.3%
Slovakia	77.3%	5.6%	750.00	17.20	27.2%	2.4%
Data	2023	Q1 2024	S2 2024	2023	2023	June 2024

Wroclaw, thanks to its dynamic development and attractiveness, draws in not just Polish specialists but also foreigners. Lower Silesian voivodship of which Wroclaw is the capital is the second most popular region in Poland in terms of the number of foreigners employed – around 120,000 foreigners are working legally in the region. Which is more, as many as 46% of Polish specialists and managers are ready to move to Wroclaw, which additionally confirms the attractiveness of the city as a place of work. Wroclaw, thanks to the large number of qualified specialists, relatively low costs of employment, and its attractiveness both for local and foreign employees, constitutes a strong technology centre against the backdrop of other European cities and attracts both talent and investments.

<sup>45</sup> Eurostat, https://ec.europa.eu/eurostat [access: 2.08.2024].

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Universities attract students and scientists from all over the world, which enriches the local labour market with international talent that often finds employment in R&D centres.

Katarzyna Sławińska

# Expert commentary

### Katarzyna Sławińska

Team Manager, Antal Engineering & Operations

Wroclaw, as a dynamically growing technology centre, offers extensive human resources with competences meeting the expectations of R&D centres, and often going an extra mile to meet their needs.

The key source and at the same time a breeding ground for new talent is the academic community. Wroclaw is home to several leading universities in Poland, which educate highly qualified specialists that are in demand among R&D centres. These include: Wroclaw University of Science and Technology, University of Wroclaw, Medical University of Wroclaw, University of Natural Sciences in Wroclaw.

The competences acquired by graduates of the universities mentioned above contribute to the continued growth of R&D teams. We have observed the tightening of cooperation between universities and employers. During their studies, students have the opportunity to complete internships, training, conduct shared research projects and take part in mentoring programmes. Such partnerships facilitate transfer of knowledge and technology from universities to business and help students and graduates gain practical experience which is key when working in R&D centres.

Wroclaw universities also offer a wide range of doctoral programmes and research projects which are the source of advanced knowledge and innovative solutions. PhD students often cooperate with businesses under research and development projects, which constitutes the direct source of talents for R&D centres. It is worth noticing the developed and active international university exchange programmes, for example Erasmus. Universities attract students and scientists from all over the world, which enriches the local labour market with international talent that often finds employment in R&D centres.

Broadly understood information technologies (IT) are at the forefront on the Wroclaw market as regards the employment and professional development opportunities.

Graduates find work in the following positions: programmers and software engineers with experience in programming languages such as Python, Java, C++, and in AI technologies, big data, machine learning, cybersecurity specialists, system and network administrators. Another important field of science which offers wide possibilities is mechanical engineering and automation. Manufacturing firms cannot sit quietly when production, automation, robotisation or digitalisation technologies are changing dynamically. This is why mechanical engineers as well as mechatronics, automation and robotics specialists have no problems finding employment, and the educational offers of Wroclaw universities enables students to precisely select the subject of studies.

In the recent years, the huge demand for education of biotechnology and laboratory research specialists has also been apparent. Wroclaw universities, in agreement with employers, have been opening new university courses for future potential specialists: biotechnologists, biomedicine specialists in pharmacy and molecular biology, specialists working on the development of medical devices and technologies, but also chemists and physicists involved in the research on new materials, nanotechnologies and optics.

The area of knowledge and science on which Wroclaw universities focus is also project management (PMP, PRINCE2), ability to implement innovation systems effectively, analysis of large data sets, and prediction modelling (date science).

We cannot forget the direction of development that is relatively knew but has been growing at a geometrical rate – i.e. sustained development. There is still a shortage of specialists working on ecological and sustainable technological solutions and those dealing with regulations, patents and compliance with regulations in the technological industry. Universities have also taken care of this area and are already offering both full-time and part-time studies, as well as post-graduate courses.

Wroclaw is characterised by many local initiatives which are aimed at supporting cooperation between universities and the industry. The best known one is Wroclaw Technology Park which constitutes a dynamic environment combining science, technology and business, and offering extensive support for firms at various stages of development.

These elements together create a strong academic base which is the basis for human resources for R&D centres in Wroclaw and which ensures constant supply of qualified specialists capable of conducting advanced research and technological innovations.





PART 5

# Summary

### Summary

The "R&D in Wroclaw" report presents a detailed analysis of the research and development sector in the city. Below, you can find three key items of data for each of the chapters of the report that relate directly to Wroclaw.



**3.9 billion zloty** internal expenditures on R&D activity in the Lower Silesian voivodship in 2022, of which a significant part is realised in Wroclaw.

**663 entities** number of firms and institutions conducting research and development activity in the Lower Silesian voivodship w 2022, with main concentration in Wroclaw.

**15 483 employees** number of persons employed in the R&D sector in the Lower Silesian voivodship, of which majority work in Wroclaw.



#### 34–percent increase in the number

of entities (2019-2022) – an increase in the number of firms operating in the R&D sector in Wroclaw, which constitutes evidence of the dynamic growth of this sector in the city.

**51%** share of firms from the engineering and manufacturing sector in the research and development activity in Wroclaw, which constitutes the larges segment of the local R&D.

**37%** share of firms from the information and communication technology sector which is the second largest area of R&D activity in Wroclaw.
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# Wroclaw market potential for the R&D expansion.

**30 universities** in Wroclaw – number of educational institutions which educate specialists necessary for the development of the R&D sector in the city.

**42 000 students** number of students educated in subjects key for the R&D sector in Wroclaw.

**64% of firms** percentage of firms which deem the educational potential of Wroclaw universities as good or very good, which supports the development of local R&D.



## Development prospect: Wroclaw as the R&D function HUB.

**56%** share of firms pointing to the development of digital technologies as the key developmental opportunity.

**45%** percentage of firms using tax reliefs connected with the R&D activity.

**20%** share of firms investing over 30% of their annual budget in the R&D activity.

The "Research and development potential in the Wroclaw agglomeration" report shows that Wroclaw has become one of the most important research and development centres in Poland, and also has been reinforcing its position in Central Europe.

When analysing the data collected, we can notice that the city has been consistently developing in many key areas connected with innovations and modern technologies.

First and foremost, the industry structure of the R&D sector in Wroclaw is extremely diverse, which constitutes one of the main assets of the city. As many as 51% of firms conducting research and development activity have been focusing on engineering and manufacturing, which proves the high level of technological advancement and industrial potential of the city. Another 37% of enterprises have been operating in the area of information and communication technologies which are key for the development of modern digital and IT solutions. Such industry diversity supports not just innovativeness but also the creation of synergy between different sectors, which in turn translates into the dynamic economic development of the region.

Wroclaw effectively integrates the R&D sector with the local academic community, which is the main factor of the city's success. The region is home to 30 universities which educate over 42,000 students in subjects key for R&D.

The cooperation between universities and business is well developed – 64% of firms deem the educational potential of Wroclaw universities as good or very good. Such approach enables firms to benefit from the latest scientific and technological achievements, which strengthens their position in the international market.

The infrastructure supporting the R&D activity is also at a very high level. In 2022, internal expenditures on research and development activity in the Lower Silesian voivodship amounted to PLN 3.9 billion, which places the region in the third position, immediately behind Mazovia and Lesser Poland. Thanks to these expenditures, the city attracts subsequent firms which want to locate their R&D centres in the region, and this in turn generates new jobs and further investments.

It is also worth emphasising that Wroclaw is a city supporting the development of startups and new enterprises. Numerous business incubators and accelerators, including Wroclaw Technology Park, offer support for young firms, enabling them to develop and market innovative products. In turn, 58% firms offer internships and training, which points to strong support for the development of human resources and further integration of the academic community with business.

To sum up, Wroclaw not only confirms its position as a leader in the field of research and development in Poland, but also shows large potential for further growth in the international arena. The diverse industry structure, strong academic base, and the significant investments in infrastructure create sold foundations for further development of the R&D sector. The city becomes not just the main player in the domestic market but also aspires to the role of an important innovation centre in Europe, attracting global projects and investor.



PART 6

# Methodology

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# Methodology

The survey has been conducted in two stages. The first stage was based on the **desk research** method, consisting in the analysis of available literature sources and secondary data. The chapter "Sources" contains the full list of all materials used that have been used to prepare the survey.

The second part of the survey has been conducted using the **CAWI** (Computer-Assisted Web Interview) and **CATI** (Computer-Assisted Telephone Interview) methods. The survey covered a sample of 403 representatives of firms conducting activity in the research and development area within the Wroclaw agglomeration. The field work was carried out between 8 July and 6 August 2024.

The CAWI and CATI methods had been selected due to their effectiveness in collecting detailed data, and at the same time they allow reaching a wide group of respondents, which ensured representativeness of the sample and reliability of results obtained.

## CHART 29. Size of the firm



### CHART 30. Location of the firm



CHART 31. Professional discipline



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# ARAW

Established in 2005, The Wroclaw Agglomeration Development Agency (ARAW) is an institution owned by the City of Wroclaw and 32 other municipalities. ARAW's mission is to promote the region, drive economic growth, attract foreign investment, support the local innovation ecosystem and animate startup environment.

Invest in Wroclaw is an entity owned by ARAW which provides high-quality support for foreign and Polish businesses not only during the investment process but also long after the company has established its activity in the region. Our knowledge, experience, and network are at your disposal.

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#### ANTAL

Antal is a leading company in the CEE region, providing solutions in the field of permanent recruitment, HR consulting and outsourcing. The brand is present in 35 countries, operating in Poland since 1996.

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