

## STRATEGIC PARTNERSHIPS IN THE DEVELOPMENT OF THE POLISH BIOTECHNOLOGY INDUSTRY

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**Purpose:** Identification of causative factors and the resulting benefits regarding strategic partnerships in developing biotechnology enterprises in Poland.

**Design/methodology/approach:** Analysis of the literature on the subject, in-depth interviews, case studies and participant observations.

**Findings:** Effective strategic partnerships in Poland are few. They intertwine with other forms of cooperation, striving to create an innovation ecosystem that can increase the commercialisation of the work being carried out.

**Research limitations/implications:** The biotechnology enterprise sector does not maintain a register of strategic partnerships. Enterprises do not willingly disclose newly developed technologies. The research is of a pilot nature and requires continuation.

**Practical implications:** No register of strategic partnerships could guide the government in developing cooperation. Identify the sector's needs and measure the effectiveness of concluded partnerships (evaluation) and the directions of collaboration undertaken.

**Originality/value:** Identification of strategic partnerships in the biotechnology industry in Poland compared to other countries.

**Keywords:** strategic partnership; cooperation; innovation; biotechnology.

**Category of the paper:** Research paper.

### 1. Introduction

Biotechnology is a discipline that has a significant impact on modernisation. It can be a source of many inspiring innovations. Therefore, it requires reasonable investment in research and thoughtful development.

In Poland, internal expenditure on research and development (R&D) activities in the biotechnology field in 2022 amounted to PLN 1,432.4 million and increased by 20.9% per year (Central Statistical Office, 2023). This amount is relatively small compared to the global

expenditure of approximately USD 600 billion (Biedrzycki, 2022). Polish biotechnology is still a relatively young discipline. Therefore, with the growing aspirations of Polish citizens and authorities, it is necessary to introduce practical strategies supporting progress and development.

The aim adopted by the authors in this article is to assess strategic partnership as a moderator of the Polish biotechnology industry's development and determine the factors shaping its effectiveness.

It was assumed that increasing investment budgets are optional for innovation development. Cooperation with the right partners can contribute to achieving much better results and thus to the development of the industry.

Strategic partnership may be underestimated in a turbulent reality; nonetheless, it impacts the improvement of management and overall progress in this sector of the Polish economy.

Based on the literature analysis, the concept of strategic partnership was formulated in the first part of the article, and its measurable benefits were indicated. Next, their importance for developing the Polish economy was analysed using the example of Polish enterprises in the biotechnology industry.

Based on pilot studies, the following were verified: different understandings of the concept of strategic partnership among experts in the biotechnology industry in Poland, which may hinder further potential cooperation, as well as factors shaping its effectiveness. An interview with a representative of the Association of Biotechnology Companies in Poland confirmed the need to expand partnerships to develop a cost-intensive industry with high technological and regulatory requirements.

The article ends with a summary in which the authors notice the potential of strategic partnerships, which constitute the nucleus of the innovation ecosystem, and indicate the determinants of effective partnerships. At the same time, they point out that the need for a register of enterprises' strategic cooperation initiatives makes their analysis difficult or even impossible.

## **2. Strategic partnerships**

According to the literature, a partnership is a relationship between independent entities resulting from their entrepreneurial market attitude based on mutual trust, commitment and responsibility. The effects of their cooperation are to be lasting and provide a specific benefit (Stern et al., 2002).

The overriding motive of the partnership is to strive to reduce the level of total costs and increase the value of the partners involved in each relationship (Cygler, 2000; Sudolska, 2010). When this type of cooperation is long-term, it is called a strategic partnership. Achieving goals

through partnerships with other entities seems more accessible and safer (Sudolska, 2010). Strategic partnerships may be formed based on the aggregation of licensing, research and development (R&D), marketing, production, commercialisation, supply and distribution agreements.

In the 1970s, during the market domination of large global corporations with their research laboratories, team research was popularised, especially among emerging industries, i.e. biotechnology (Kopczyński, 2023). However, since the 1980s, the largest U.S. pharmaceutical companies have demonstrated dynamic capabilities by investing in external strategic partnerships with biotechnology entities (Schramm et al., 2022). The goal was to complement internal R&D capabilities by leveraging partners' biotechnology expertise and R&D efforts (Galambos, Sturchio, 1998). Strategic partnerships are a crucial element of building competitive advantage (Doz, Hamel, 1998), which was quickly noticed by the pharmaceutical industry.

An example could be a case study of Genentech (a biotechnology company) with Eli Lilly (a pharmaceutical company), which defended its position as the insulin leader in the American market in the 1980s and successfully entered the European market by introducing the first recombinant human insulin - Humulin.

The strategic partnership is based on risk sharing and aims to achieve common business goals and mutual benefits. The table below presents the benefits resulting from the collaboration in question.

**Table 1.**

*Mutual benefits resulting from the strategic partnership on the example of Genentech and Eli Lilly*

No.	Genentech benefits	Eli Lilly benefits
1.	Access to Eli Lilly's financial and production resources. Although Genetech had developed an innovative technology for insulin production, it needed to have the scale to commercialise its product quickly and effectively on a mass scale.	Technological advantage - among others, over Novo Nordisk, which was also developing its insulin production technology.
2.	Faster technology commercialisation. Eli Lilly's distribution channels, as well as contacts with doctors and medical institutions, shortened the time of product launch.	Increasing production safety and efficiency. Cheaper, more efficient production compared to obtaining insulin from animals.
3.	Consolidating its position in the biotechnology market (a young company gained the status of a biotechnology pioneer).	Recognition among doctors and patients (a product more similar to natural, human insulin).
4.	Profits from licenses allowed for further development of innovative drugs and technologies, such as oncology drugs or monoclonal antibodies, which brought considerable successes in the following decades.	Maintaining a dominant position on the insulin market and strengthening the global leadership in diabetes treatment.

Own study, Source: Miller, 2019; Kopczyński, 2023.

The license with Eli Lilly was more beneficial for Genentech than its commercialisation. The biotechnology company gained new experience from this cooperation, which was an investment in further innovative solutions. Today, it is a partner of the Roche group. As stated on its website (<https://www.gene.com/partners>):

*Approximately half of Roche and Genentech products and medicines sold on the market result from successful cooperation with companies and institutions worldwide.*

Eli Lilly and Genentech's strategic partnership not only marked a success for the companies but also demonstrated that regulatory agencies, such as the U.S. Food and Drug Administration, can adapt to breakthrough technologies, accelerating drug approval.

The foundation of strategic partnerships is building lasting and trust-based relationships. Trust is essential for effectively sharing knowledge, resources and responsibility (Jakubowski, 2024). Strategic partnerships provide access to external experiences, technologies and assets that expand the internal understanding of enterprises (Akram et al., 2020). A crucial element of strategic partnership is the mutual complementation of competencies. Therefore, when selecting partners, it is essential to determine how to match or complement internal research and development knowledge. Open communication and regular information exchange allow for monitoring progress and quick responses to possible problems.

The scope and complexity of partnerships vary. The more complex solutions companies need, the more often they seek specialist knowledge from various external partners (Ng, Sánchez-Aragon, 2024). Strategic partnerships can provide benefits, including access to new knowledge, reduced product development risk, and faster time to market for innovations (Liu et al., 2016). However, they can also contribute to generating losses. External spill-over effects are often presented as inputs independent of the company's research and development (Boeing, Hunerman, 2020; Martínez-Sánchez et al., 2020; Tung, Binh, 2022).

In today's dynamic market, the concept and description of strategic partnership will change according to its evolution. Therefore, it can be assumed that strategic partnership is still a poorly structured area of research and, consequently, very interesting for further analysis (Adamik, 2015). According to the article's authors, strategic partnership today is intertwined with other forms of cooperation, i.e. open innovation or cooperation networks, undoubtedly leading to the development of an innovation ecosystem.

In this article, strategic partnership is understood as a specific form of cooperation based on voluntary interdependence between two or more partners, the purpose of which is to share knowledge and resources with partners so that they bring benefits to all parties.

### **3. The essence of strategic partnerships in the biotechnology sector - biotechnology as a source of breakthrough innovations**

Biotechnology is one of the most critical sectors of the knowledge-based economy, where the most dynamic increase in R&D expenditure is observed (Marszałek, 2022). The potential for biology-based solutions to social problems makes biotechnology one of this century's most promising technological areas.

Biotechnology is used in medicine (according to Niosi & McKelvey (2018). Six out of ten most frequently sold drugs are biotechnological products), agriculture, food, pharmaceutical and cosmetics industries. It can support various sectors of the economy and develop industries, but it can also be related to bioterrorism and address the issue of biological weapons.

The biotechnology industry, in which intellectual capital plays a key role, has become a driving force for dynamic changes in other sectors of the economy. Its dependence on the efficient implementation of innovations (Marszałek, 2022) may determine the success of strategic partnerships.

Biotechnology in Poland is one of the industries in which innovative activities are most often undertaken. Nevertheless, it must work on high research and development costs, limited commercialisation and constant technological changes. As a result, interest in external partnerships is growing (Runiewicz-Wardyn, 2020).

Research and development are the main factors in the development of many enterprises, which determine their competitiveness. According to the literature on the subject, an essential feature of the research and development process of enterprises is the law of diminishing returns (Leiponen, Helfat, 2010; Ravichandran et al., 2017; Boeing, Hunerman, 2020), which mainly large enterprises struggle. This law means that when we increase research and development budgets, we achieve a decrease in innovative productivity. This relationship was confirmed, among others, by a study by Graves & Langowitz in 1993, where increased investment decreased the discovery of new chemical entities. Scientists have noted the notable presence of this law in the case of mergers and acquisitions. Knott came to similar conclusions in 2017, stating that pharmaceutical companies like Pfizer can improve innovation performance by reducing research and development budgets by three billion dollars annually. The author proved that optimising resource allocation is the key to increasing productivity in R&D instead of just growing budgets.

Large companies are more prone to financial risk and bureaucracy, which challenge introducing creative ideas (Schumpeter, 1995). The antidote may be a strategic partnership with a smaller enterprise or start-up. Investment projects in biotechnology are of a long-term nature, so they are assumed to fit into the concept of strategic partnership (Doz, Hamel, 1998), which provides a good chance of success and the development of new, promising products or services.

For years, the United States has been a leader in developing and consolidating global biotechnology (Barcelos et al., 2018). In the European Union, strategic partnerships are in their infancy. The European Commission sees them as an opportunity to stimulate European biotechnology by proposing targeted actions (European Commission, 2024), i.e.:

- creation of large, regional partnerships for upskilling and change aimed at strengthening biotechnology skills;
- creation of regional innovation valleys aimed at supporting cooperation and synergy through the implementation of technologies related to biotechnological processes;
- launching international biotechnology partnerships with key global partners, i.e. the United States, India, Japan and South Korea.

Strategic partnerships played a significant role in the growth of the United States power in the 1980s. The E.U. is also focusing on its development in the biotechnology industry, drawing on the experience of a world leader. Biotechnology, with its intellectual capital and in combination with other economic sectors, has a chance to improve the quality of our lives in a turbulent world. A significant condition for their effectiveness is the proper selection of partners.

#### **4. Strategic partnerships in Polish biotechnology enterprises**

At a time when the E.U. is creating strategic partnerships for the development of the economy, biotechnology enterprises in Poland need help with obstacles in raising capital. The barriers are the need for proper communication of capital needs and the inappropriate way of presenting investment projects (Newseria Business, 2022). Many promising, innovative companies are looking for support abroad, taking advantage of the greater flexibility of investors there.

Noteworthy is the decline in cooperation of Polish enterprises with universities and public research institutions in favour of collaboration with other enterprises in the country and abroad (conclusion observed based on Central Statistical Office data for the years 2016-2018 and 2018-2020 regarding the cooperation of enterprises with selected entities, including universities, public research institutions, enterprises outside the own enterprise group, enterprises belonging to the own enterprise group), which may indicate a lack of trust in these potential partners.

In Poland, there has yet to be a list of concluded strategic partnerships despite detailed monitoring of R&D entities, which must submit a scientific and research potential assessment form to the Central Statistical Office once a year.

The effectiveness of strategic partnerships can be verified by the ability to generate profit from the cooperation concluded (commercialisation). Their efficacy is quickly noted in the industry press. For instance, out of 187 enterprises conducting biotechnology activities in

Poland (Central Statistical Office, 2023), only a few significant, successful initiatives were recorded in 2022, presented in Table 2.

**Table 2.**

*Selected examples of effective partnerships in the biotechnology industry in Poland in 2022*

Partnership		Partnership result	Description
Polpharma Biologics (P.L.)	Santo Holding (Strüngmann Group) (DE)	Biosimilar medicine	Bioeq CIMERLI™, a biosimilar drug to Lucentis®. It treats the wet form of age-related macular degeneration and other serious eye diseases.
Scope Fluidics (P.L.)	Bio-Rad Laboratories, Inc. (U.S.)	Commercialisation	Commercialization Curiosity Diagnostics Sp.z o.o.
Captor Therapeutics (P.L.)	Ono Pharmaceutical (JPN)	Cooperation agreement	Cooperation in developing small molecules capable of degrading a molecular target may be applicable primarily in neurodegenerative diseases, as agreed by both parties.
Ryvu Therapeutics (P.L.)	BioNTech (D.E.)	Cooperation agreement	Scientific agreement and agonist development STING.

Source: Biedrzycki, 2022.

Based on the data presented in Table 2, it can be seen that Polish biotechnology companies, although to a relatively small extent so far, are establishing partnerships with foreign entities. The reason for these initiatives is the partners' stable market position and the ability for them to co-finance costly research work. The cooperation mainly concerns the development of new products in the healthcare sector.

In Poland, the idea of strategic cooperation is just developing. The biotechnology sector is composed mainly of small and medium-sized enterprises (SMEs), which ideally meet the needs of complementing the specialist knowledge of entities from other sectors on a partnership basis. Strategic cooperation has been dominated by cooperation between biotechnology and pharmaceutical companies.

## **5. The concept and purpose of strategic partnership according to biotechnology industry experts - research method used and results**

Due to the need for a clear definition of strategic partnership in the literature on the subject, the article's authors attempted to define this concept and establish its goal and factors shaping its effectiveness among representatives of the biotechnology industry in Poland. Therefore, in October 2024, a pilot study was conducted based on three face-to-face interviews. The respondents were randomly selected representatives of middle or senior management from various biotechnology enterprises in the SME sector in Poland (experts) who believe that strategic partnership significantly impacts the sector's development. The experts' answers are

presented in Table 3. A Likert scale from 1 (not very important) to 5 (very important) was used to assess the factors influencing the effectiveness of strategic partnerships. The respondents' answers were assigned to 5 groups with weights assigned to them, the sum of which is 100%.

The pilot study was supplemented with an interview with the President of the Association of Polish Biotechnology Companies on the current situation of strategic partnerships in the Polish biotechnology industry. The interview was conducted in October 2024.

**Table 3.**

*Results of interviews conducted among employees of the biotechnology industry*

No.	The concept of strategic partnership	The goal of strategic partnership	Is a strategic partnership with a university possible?	Factors shaping the effectiveness of cooperation (scale from 1 – not very important to 5 – very important)
1.	Synergistic cooperation is based on mutual trust, understanding the needs of the partners, and giving priority to partners to obtain mutual benefits. The party looking for a solution trusts the party, providing it that it will fully meet its needs by making its resources available. The ordering party consciously shares its resources and know-how to meet the other party's needs best.	Mutual benefits	Yes	Fulfilment of the goal assumptions (5); Transfer of knowledge and know-how between partners (5); Continuation of cooperation (3)
2.	Buying or selling products that generate significant revenues or provide the tools necessary to develop the business further.	Revenue, company development	Yes, but the university will only take such a partnership seriously if it is a nonprofit institution with financial benefits.	Trust (5), aligned goals to achieve the best results (5), flexibility in adapting to changing market conditions (4)
3.	An agreement between two parties, two entities with a common goal, idea and one account.	Project, product or portfolio development. Profit.	Yes	Trust (5); achieving the goal, beneficial to each party (4); commitment (4)

Own study based on interviews, October 2024.

Each respondent presented their definition of partnership, which includes a goal and aims to obtain benefits for all partners. However, the number of participants who can participate in such cooperation has yet to be specified. The duration of such a partnership was not defined either. In a follow-up interview, a period of long-term collaboration was agreed upon, during which universities could also participate. In this context, one of the respondents pointed out the need for more university involvement due to the divergence of goals. This remark may respond to the decline in interest in cooperation between enterprises and universities (ad. chapter 4). It was found that although the definitions of strategic partnership among sector representatives are diverse, the assumptions accompanying this definition are similar.



The responses regarding factors influencing the effectiveness of strategic partnerships were assigned as follows (see Table 4).

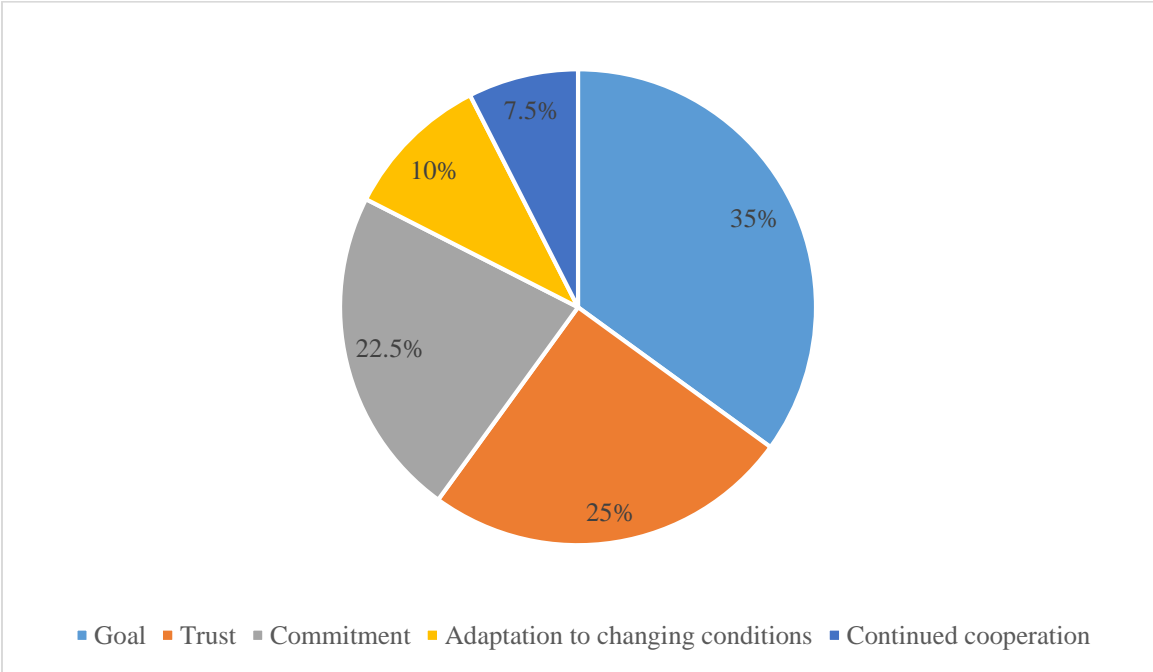
**Table 4.** Factors shaping the effectiveness of strategic partnerships according to experts from the biotechnology industry in Poland

	Factor				
	Goal	Trust	Commitment	Adaptation to changing conditions	Continued cooperation
The sum of weights assigned by experts according to the Likert scale	14	10	9	4	3
Sum of weights	40				

Description: Purpose - understanding and achieving the goal. Commitment, including knowledge sharing.

Own study, based on interviews, October 2024.

According to the respondents, the same understanding of the goal and its achievement is the most critical factor determining the effectiveness of a given partnership (cooperation). This factor was indicated by 35% of study participants. The following factors are trust (25%) and commitment to collaboration, facilitating knowledge transfer and sharing know-how (22.5%). Other factors include adapting to changing market conditions (10%) and continued cooperation (7.5%). The factor responses are illustrated in Figure 1.



**Figure 1.** Factors shaping the effectiveness of cooperation in the biotechnology industry.

Own study, based on interviews, October 2024.

According to the President of the Association of Polish Biotechnology Companies, enterprises increasingly understand the essence and benefits of strategic partnership since it is an essential factor enabling them to keep up with technological development in Western economies. The pace of change and the high research costs encourage companies to cooperate

and share the costs and risks of developing an innovative solution. In the case of the Polish market, these are primarily bilateral partnerships concluded between enterprises or an enterprise and a university. Partnerships with more participants are created between universities or in international projects, such as in the case of projects from European programs or the Institute for Healthcare Improvement.

Moreover, in the President's opinion, strategic partnerships significantly impact the development of the biotechnology industry in Poland, which is very cost-intensive and has high technological and regulatory requirements. Hence, exchanging knowledge, experience, and resources is necessary to reduce the risk associated with developing innovative technologies.

## 6. Discussion

Creative, agile biotechnology companies from Poland are looking for partners internationally. The Polish biotechnology sector consists mainly of SMEs that require promotion and support in global markets. For this purpose, creating a Polish centre of biotechnology excellence would be invaluable.

In Poland, the idea of strategic cooperation is just developing. Currently, these are bilateral partnerships. Partnerships between biotechnology companies and entities from other industries should be launched, as there is a huge opportunity to obtain benefits in many areas of the economy through the synergistic use of their resources and competencies. It is worth introducing a register of strategic partnerships to monitor undertaken partnerships and assess their effectiveness.

The strategic partnership is an alternative to developing the biotechnology sector in Poland. However, it may remain unnoticed in the dynamic world of the interpenetration of many forms of cooperation and business models. It inevitably leads to the development of an innovation ecosystem.

Similar to the literature analysis, the pilot studies indicated the importance of trust, lasting relationships, and knowledge (also confirmed by the case study in Chapter 2) in strategic partnerships in biotechnology. Improving cooperation with universities using extensive teaching and research facilities may be crucial. In this situation, universities should be held accountable for their impact on the development of the Polish economy, in this case, on improving the biotechnology sector. Creating new forms of cooperation can only occur with significant support from institutional structures (Niosi, McKelvey, 2018). The achievement of the assumed goal is the main factor determining the effectiveness of a strategic partnership.

The Polish biotechnology sector needs strategic partnerships to integrate and strengthen cooperation between Polish companies and foreign partners to increase the credibility of Poland and domestic biotechnology internationally (Medexpress, 2024). The post-pandemic reality, which Cascio (2020) called the BANI acronym, defining the world as brittle, anxious, non-linear and incomprehensible, describes a situation which lacks ready-made action patterns and a simple answer to the question of how to manage the Polish biotechnology sector.

## 7. Summary

Based on the literature analysis, qualitative research and participant observations, the following conclusions have been formulated regarding strategic partnerships for the development of Polish biotechnology:

- There is no established, universally accepted definition of strategic partnership. The variety of its interpretations may make communication between potential partners easier.
- A strategic partnership is not only a partnership between enterprises but also the relations between enterprises and start-ups, universities, and public institutions. The potential of cooperation with universities and public institutions still needs to be used (Sieracka, Wirkus, 2022).
- The pharmaceutical sector dominates strategic cooperation with the biotechnology industry.
- The need to register strategic cooperation initiatives among enterprises makes their analysis difficult. It is worth considering changes to the current data collection system by the Central Statistical Office (complete study).
- Polish biotechnology enterprises are mainly entities from the SME sector, characterised by high creativity. They can complement the expert knowledge of entities from other industries and international corporations as part of strategic partnerships.
- Strategic partnership reduces the risks associated with the development of innovative technologies.
- Imitating American strategic partnerships in Poland may be impossible due to the lack of similar concerns capable of carrying out R&D.
- Polish strategic partnerships are concluded mainly with foreign entities.
- It is worth promoting Polish strategic partnerships globally with the government's support.
- Trust and commitment leading to the achievement of the assumed goal of the strategic partnership are the main factors determining its effectiveness.

The strategic partnership in the biotechnology sector in Poland is still a new phenomenon. It is often combined with other forms of cooperation in this area. It has yet to become an industry moderator, which constitutes a challenging field for further research. It is the nucleus of an innovation ecosystem that should undoubtedly be developed. Additionally, international partnerships should be established with the support of state authorities.

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