

Development of Modes of Cooperation: An Opportunity for Open Innovation Alliances in Polish Biopharmaceutical Industry

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This article presents development of modes of cooperation in biopharmaceutical industry, referring to the latest data from the ASAP (the Association of Strategic Alliance Professionals). Examples of different modes of cooperation in contemporary economy as well as potential cooperation between academia, institutions and business in the field of biopharmaceutical industry in Poland are discussed. Biopharmaceutical companies try to implement new strategies to transfer their research processes to a higher level, often using open innovation model as an additional tool for developing new products and services. Thanks to the cooperation with universities in the framework of open innovation alliances, through joint work with academic researchers, biopharmaceutical companies are more successful in identifying disease mechanisms, implementation of better medical therapy for patients as well as in development of new drugs.

Key words: alliances and joint ventures, biopharma, biotechnological cluster, science and technology parks, public-private partnerships, open innovation, open innovation alliance

Introduction

We can find many interesting publications on technological cooperation between companies in the economic and management literature: the distinction between cooperation based on the transfer and exchange of technology, R&D arrangements and joint-ventures (Auster 1987; Casson 1987; Chesnais 1988; Contractor and Lorange 1988a). Technological agreement can be divided from one-directional to the ones that are based on strong relationships between companies, e.g. joint-ventures, research corporations, on the other hand, those which require less organizational dependencies (contractual arrangements such as joint R&D agreements or technology exchange agreements). Many studies have shown that these

types of technological cooperation have different effects on the nature of the sharing of technology, level of competitiveness, organizational aspects and the possible economic consequences for the companies participating in cooperation (Auster 1987; Root 1988; Contractor and Lorange 1988b; Hagedoorn 1990; Hagedoorn, Link, and Vonortas 2000; Gomes-Casseres, Hagedoorn, and Jaffe 2006; De Man and Duysters 2007; De Man, Duysters, and Neyes, 2009; Puślecki 2010). Technological cooperation is a very important channel of diffusion of knowledge in both sectors: public and private. Companies in an increasing way try to use global strategic partnerships in order to strengthen its position, enhance core competencies and skills and acquire new technologies. Through this partnership they can gain new opportunities to share the risk of the development of new technologies, on new, emerging markets (Puślecki 2010; 2012).

Strategic alliances can be defined as a special mode of cooperation between at least two parties (competitors or partners) operating in the same or related sectors with the aim of achieving common goals which have been set up with the use of available resources, while preserving the autonomy of each partner, in a range of fields and areas not covered by the partnership agreement (Gomes-Casseres 1996; Das 2005). The alliances are typically formed between two firms but can be also created with universities, research institutes, nonprofit research organizations, or government institutions (Baum, Calabrese, and Silverman 2000). Taking into account strategic technology alliances, they are implemented primarily through joint ventures (an alliance of two or more participants forming a separate entity with the aim of achieving common goals); so-called equity alliances; or, within capital alliances and R&D cooperation agreements, so-called non-equity alliances. Technological alliances are understood as strategic if they improve the long-term perspective of the product market combinations for at least one company involved in cooperation. Technological partnerships are defined as a form of cooperation which includes at least some innovative activity or an exchange of technology between partners (Duysters and Hagedoorn 2000).

The challenges of contemporary world economy require more advanced and complex alliances between companies that can deliver new products and services as fast as possible on different markets. That is why the constellation of cooperation nowadays contains higher number of global strategic relationships with the involvement of many parties. Biopharmaceutical companies (BioPharma companies) thanks to multiparty cooperation can gain significant synergy

effects, as well as reduce the risk of conducted joint research and projects. Through new and innovative paths of development and successful strategies of transfer of research results, in recent years, biopharmaceutical companies have developed new models of collaboration, including not only alliances with partners from industry but also with universities and academic research institutes as well as open innovation alliances, public-private partnerships and cross-industry alliances. Thank to that modes of cooperation it was possible for them to obtain a much more advanced research results in both preclinical and clinical stages. The effect of such actions can be jointly developed new drugs proposals, with significant reduction of R&D costs and faster delivery of new solutions and technologies to the market than before (Laviertes 2012).

This conceptual paper presents development of cooperation modes of companies, based on the latest data from the ASAP (the Association of Strategic Alliance Professionals) and on initial research conducted in Polish biopharmaceutical industry (Puślecki and Staszaków 2015). The second chapter of the paper constitutes a theoretical base of the analysis and is devoted to the different theoretical approaches to the phenomena of open innovation and open innovation alliances as well as describes development of modes of cooperation between companies, universities and institutions. The third chapter presents examples of open innovation alliances and different modes of cooperation in biopharmaceutical industry in contemporary economy. The fourth chapter presents potential cooperation paths for Polish companies, universities and research institutes and discuss the concept of development of open innovation alliances in Poland as well as creation of open innovation alliance network in Polish biopharmaceutical industry. Taking into consideration significant results of such cooperation in form of open innovation alliances, as well as public-private partnerships and research consortia in us and UK in biopharma industry (especially in drug discovery and implementation of new biopharmaceutical products) and the potential of Polish biopharmaceutical industry it can be assumed that open innovation alliances in Poland might be implemented. The last part of paper contains conclusions and discussion.

Development of Modes of Cooperation in Biopharma

The development of innovative projects and services requires from companies the use of modern models of partnerships based on the principles of Open Innovation. Chesbrough (2003) defines 'open innovation' as the paradigm stating that companies can and should use

external and internal ideas, as well as internal and external paths to market. According to the latest definition by Chesbrough open innovation is 'a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with each organization's business model' (Chesbrough and Bogers 2014). This concept can be used in bilateral and multilateral alliances. Open innovation model is more dynamic than traditional alliances, because partners in alliance are not in fact identified in the conventional, purposeful way. Relationships rely more on the exchange of knowledge and ideas during the period preceding the creation of the alliance. The main aim of open innovation alliances is to support the free flow of knowledge and ideas that will lead to the creation of partnerships aimed not only at joint innovation, but also at risk and profit sharing (Wilks and Prothmann 2012). The results of research on open innovation have shown how firms manage both the inflows and outflows of knowledge and how they search for partners and the innovations they provide (Culpan 2014; West 2014). In last years we can also observe how companies in specific industries (like biopharma) use the model of open innovation to create open innovation alliances not only with firms from the same or other industry but also with universities, individuals, communities or other organizations (DeWitt and Burke 2012; OECD 2012; Wilks and Prothmann 2012). Companies have defined and implemented open innovation in a number of ways, including building innovative ecosystems or innovations for users, crowdsourcing or through the creation of joint development alliances. Open innovation alliances may include partnerships between profit-based companies and non-profit organizations (e.g. universities). This form of cooperation in recent years has aroused increasing interest of biopharmaceutical companies. Moreover biotechnology and pharmaceutical companies are more involved in multilateral cooperation in the framework of knowledge networks or open innovation alliances, cross-industry alliances as well as public-private partnerships (for instance Pfizer or GlaxoSmithKline) (OECD 2012; Puślecki and Staszów 2015; Wilks and Prothmann 2012).

Biopharmaceutical companies have developed cooperation with universities for many years. At the beginning, the cooperation covered mainly individual, single projects, from small research projects to large clinical trials. Afterwards the companies entered alliances with individual academic institutions, covering a wider range of cooperation, through: research programs, clinical trials and translational research, with the aim to transfer the results of basic re-

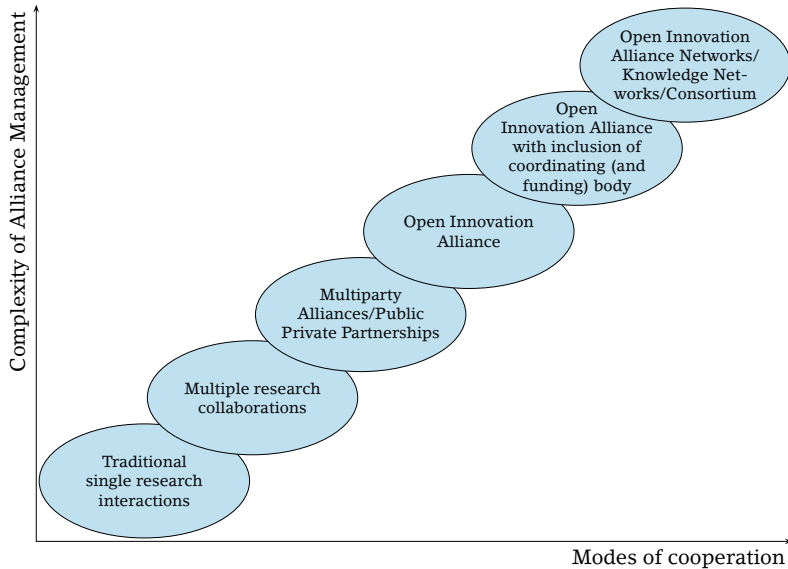


FIGURE 1 Development and Complexity of Different Biopharma-University Multiparty Alliances and Partnerships

search to practical application. Companies also increasingly began to use different models of alliances, from individual links in research projects to multilateral agreements involving multiple research projects, including various models for open innovation, for example where the main role of an academic institution was the coordination and sometimes funding of other institutions. Compared to existing models of alliances the organizational fluidity of open innovation initiatives as well as multiparty relations increase the complexity in the management of alliances (figure 1). The alliance management in open innovation alliances plays a central role, especially in defining the alliance portal and framework. The use of open innovation model can significantly speed up the production process of new drugs and biotechnology products. Moreover involvement in the cooperation of more interdisciplinary academic teams may also accelerate and support this process (Laviertes 2012; Wilks and Prothmann 2012).

Examples of Different Modes of Cooperation in the Biopharmaceutical Industry

In recent years we can observe a wider range of open innovation model and other forms of partnerships (public-private partnerships, consortia, cross-industry alliances) used by biopharmaceutical com-

panies for therapeutic interventions for patients and new drug proposals (table 1). Examples of such alliances can be seen as a pioneer in testing models of multilateral alliances for the development of drugs (drug development alliances). The goal of these partnerships is to understand the mechanisms of diseases and the discovery of new utility of existing drugs that beyond their current curative role will allow identification and development of new drugs (Lavietes 2012; Wilks and Prothmann 2012).

Analyzing examples of partnerships in biopharmaceutical industry presented in table 1 we can observe different modes of cooperation: open innovation alliances, public-private partnerships, consortia, pharma-university alliances, cross-industry alliances as well as different entities involved in cooperation including: governments, universities and research institutes, foundations, funds, banks and organizations.

This kind of constellation of partners is very sensitive and difficult to manage, the problem of one entity or organization could affect all partnership and have negative effect on delivery of new drugs or new medical therapies. As multiparty alliances they require even greater competences and skills of alliance managers and appropriate alliance management tools. On the other hand being a part of such constellation, thanks to significant synergy effects, gives the partners access to huge innovative potential and to more market opportunities, which helps them to innovate, accelerate growth and expand into new promising markets (DeWitt and Burke 2012; 2013; Fraser 2014).

Possible Application of Open Innovation Alliance Model in Polish Biopharmaceutical Industry

Taking into account the pharmaceutical and biotechnology industries they can be perceived as one of the most innovative sectors in Poland. The Polish pharmaceutical market is one of the industries with the longest tradition. It has undergone a number of fundamental changes in the last twenty years (change in ownership structure, new regulations, growing role of foreign pharmaceutical companies as investors). Following the data included in the report on pharmaceutical market in Poland, provided by Espicom Business Intelligence company and published by Polish Information and Foreign Investment Agency (PAIIZ 2011), over the past 10 years, the pharmaceutical market in Poland recorded a steady growth and reached PLN 22.3 billion in 2011. In comparison with the previous year, sales increased by an impressive 11%. The average annual growth rate in

TABLE 1 Examples of Modes of Cooperation in Biopharma

Partners	Mode	Aim
AstraZeneca + us National Cancer Institute + uk National Cancer Research Network + Cancer Research uk.	Open Innovation Alliance with a coordinating body.	Initially oncology collaborations.
AstraZeneca + uk Medical Research Council (MRC).	Open Innovation Alliance with a coordinating and founding body (crowdsourcing).	Crowdsourcing agreement for experimental drugs to researchers.
NIH's new National Center for Advancing Translational Sciences (NCATS) + multiple biopharmaceutical companies.	Open Innovation Alliance.	Provide academic investigators with funding and access to drug candidates to explore new treatments for patients.
World Health Organization (WHO) + UNICEF + World Bank + Bill and Melinda Gates Foundation + Biopharma companies.	Public-Private Partnership.	GAVI Alliance (Global Alliance for Vaccines and Immunization) to deliver needed vaccines to children in developing countries, particularly in Africa and Asia (http://www.gavi.org).
National Health Service (NHS) in Scotland + Pfizer + four Scottish Universities.	Public-Private Partnership.	Translational Medicine Research Collaboration (TMRC).
14 academic research institutions + 8 pharmaceutical industry research organizations + biotech company.	Public-Private Consortium.	Innovative Medicines Initiative for Diabetes (IMI12) seeks to lay the foundation for a paradigm shift in the treatment of diabetes, from symptomatic to pancreatic beta-cell-focused cure of pandemic disease (www.imidia.org).
Innovative Medicines Initiative (IMI2).	World biggest Public-Private Partnership in the life sciences.	€3 Billion partnership launched in 2014 for period 2012-2024. The goal of IMI2 is to ensure that research conducted is translated into implementable solutions to current healthcare challenges. IMI2 aims to deliver: (1) a 30% better success rate in clinical trials of priority medicines identified by the WHO, (2) clinical proof of concept in immunological, respiratory, neurological and neurodegenerative diseases in just five years, (3) new and approved diagnostic markers for four of these diseases and at least two new medicines which could either be new antibiotics or new therapies for Alzheimer's disease (www.imi.europa.eu/content/imi-2).

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TABLE 1 Continued from the previous page

Partners	Mode	Aim
Global Fund to Fight AIDS, Tuberculosis and Malaria (GFAM) – partnership between governments, civil society, private sector (including businesses and foundations), and affected communities.	Public-Private Partnership.	The Global Fund is accelerating the end of AIDS, Tuberculosis and Malaria as epidemics (www.theglobalfund.org).
GlaxoSmithKline + AstraZeneca + Sanofi + Janssen + Basilea Pharmaceutica + leading academic institutions.	Pharma-University Alliance.	Development of new antibiotics to combat the growing problem of drug resistant microbes.
Pfizer + Eli Lilly + AstraZeneca + National Institutes of Health's National Clinical and Translational Sciences (US).	Pharma-University Alliance.	Awarding grants to fund preclinical and clinical feasibility studies for new uses of more than 20 compounds shelved by the pharmaceutical companies because they failed to work in the diseases for which they were being pursued.
GlaxoSmithKline (GSK) + Gustave Roussy (Villejuif, France) + University of Texas MD Anderson Cancer Center (Houston, TX) + Memorial Sloan-Kettering Cancer Center (New York) + Netherlands Cancer Institute (Amsterdam) + Princess Margaret Cancer Centre, University Health Network (Toronto) + Vall d'Hebron Institute of Oncology-VHIO (Barcelona).	Consortium.	OncologyClinical and Translational Consortium (OCTC).
Pharmaceutical Product Development (PPD) + Virtual Scopics, Inc.	Cross-Industry Alliance (Biopharma + IT).	Expand successful strategic alliance in clinical and medical imaging services across multiple therapeutic areas to now include oncology, central nervous system, cardiovascular, general medicine, and medical devices.
GE Healthcare + M+W Group.	Cross-Industry Alliance (Biopharma/Healthcare + Engineering/Construction).	Strategic alliance aimed at overcoming the lack of key biopharmaceuticals in emerging nations. The alliance will combine GE Healthcare's expertise in technologies for biopharmaceutical manufacture with M+W Group's global capabilities in bioengineering and construction in order to assist countries worldwide to become self-sufficient in the manufacture of vital biopharmaceuticals such as vaccines, insulin, and biosimilars.

NOTES Based on data from ASAP (<http://www.strategic-alliances.org>), DeWitt and Burke (2012), Wilks and Prothmann (2012) and Burke (2013).

Development of Modes of Cooperation

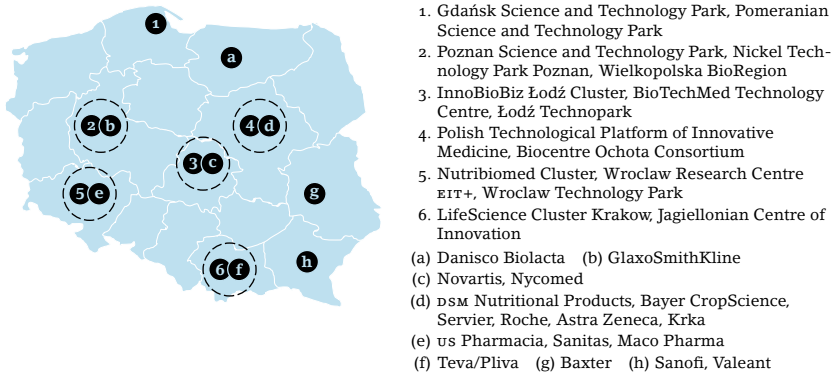


FIGURE 2 The Biggest FDI in the Pharmaceutical Industry and Location of Biopharmaceutical Clusters (letters) and STPs (numbers) and Possible Open Innovation Alliances (OIA, dashed circles) in Poland (based on PAIIZ 2012)

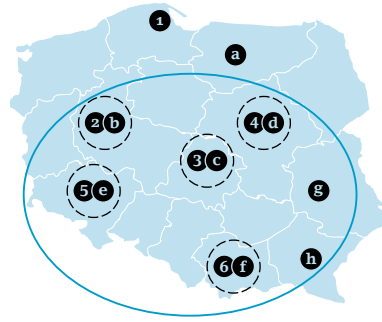
the period 2003–2010 was 6.5%. The estimated value will probably reach more than 60 billion PLN by 2016 (current prices). Poland is the largest pharmaceutical market in Central and Eastern Europe (and the sixth in Europe). Nearly 33% of pharmaceutical and biotechnology companies have their headquarters in the Mazowieckie Region (Warsaw). Almost 80% of all companies can be classified as micro-enterprises (PAIIZ 2011; 2012).

Following the results of the PwC (2011) study any innovative pharmaceutical company participates on average in at least 5 projects aimed at building a coalition inside the industry. In Poland we can find number of clusters and numerous science and technology parks (STPs), that offer the infrastructure for the development of innovative biotechnological and pharmaceutical products – in particular, the laboratory space.

We can distinguish following clusters and STPs operating in biopharma in Poland: Poznan Science and Technology Park, Nickel Technology Park Poznan, Wielkopolska BioRegion, Gdansk Science and Technology Park, Pomeranian Science and Technology Park, InnoBioBiz Lodz Cluster, BioTechMed Technology Centre, Lodz Technopark, Polish Technological Platform of Innovative Medicine, Biocentre Ochota Consortium, NutriBiomed Cluster, Wrocław Research Centre EIT+, Wrocław Technology Park, LifeScience Cluster Krakow, Jagiellonian Centre of Innovation (Puślecki and Staszków 2015; Staszków 2013) (figure 2).

Taking into account the number of entities involved in Polish biopharmaceutical industry, especially pharmaceutical companies,

FIGURE 3
Possible Open Innovation Alliances
(OIA, dashed circles) and Open
Innovation Alliance Network
(blue ellipse) in Poland



universities and research institutes, clusters and STPs, it can be concluded that they can successfully apply the model of cooperation based on open innovation alliances (figure 3), in particular in biotechnology clusters, for example in the Life Science Park in Cracow or Lodz BioNanoPark or in Nickel Biocentrum in Poznan (Puślecki and Staszaków 2015). This topic will be further investigated by author and his research team in the future research, conducted in Poland and in selected CEE countries.

Participation of a coordinating institution (for instance cluster or STP or national academic institution) can improve the process of communication, strengthen the introduction of standardization and create networks and processes of academic institutions who are willing to form an alliance within or with the cluster. It can contribute to greater efficiency of scientific, cultural, economic, and most of all innovative potential. The development of cooperation with universities and research institutes may result for companies in a faster process of products' commercialization or obtaining test results faster, which is very important in the development of new biotechnology and pharmaceutical products. This can be realized by creation of open innovation alliances with interdisciplinary research teams. There should be also considered the development of multi-party alliances between academia, institutions and business through creation of open innovation alliance network in Poland (multilateral cooperation between all biotechnology clusters, STPs, universities and research institutes as well as pharmaceutical companies) (figure 4).

Implementation of joint activities between all the partners, including appropriate alliance management tools and multiparty alliance strategies can contribute to the dynamic development of the biopharmaceutical industry in Poland, as well as better use of research and innovative potential of all parties, involved in cooperation, in delivering new products, services and better therapies for patients.

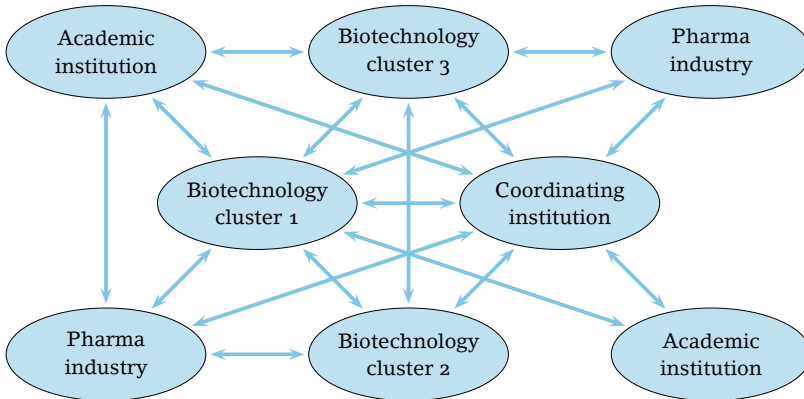


FIGURE 4 An Example of the Possible Use of Open Innovation Alliance Network Including Academic or National Institution as a Coordinating (and Possible Funding) Body in Polish Biopharmaceutical Industry

Conclusions

Biopharmaceutical companies look for various forms of cooperation that will minimize the risk and will share the costs of R&D investment. Cooperating with academic institutions, particularly in the model of open innovation alliances or pharma-university alliances, they can significantly increase the likelihood of better medical therapy for patients. In addition to partnerships within the industry, they establish relationships with universities or research institutes as well as more often cross-industry alliances and public-private partnerships. This cooperation enables a number of innovative projects and allows significant synergy effects. It should be taken into account, that as multiparty alliances they require greater competencies and skills of alliance managers and appropriate alliance management tools, particularly in the selection of potential partners, as well as in creation and maintenance of alliance networks. Thanks to diversity of modes of cooperation and alliances it was possible for biopharmaceutical companies to obtain a much more advanced research results in both preclinical and clinical stages. The effect of such actions can be jointly developed new drugs proposals (Wilks and Prothmann 2012; Burke 2013).

Biopharmaceutical companies operating in Poland, involved in cooperation with academic institutions, especially in the model of open innovation alliances, can also significantly reduce the risk and cost of research, use the resources, competencies, technology and knowledge from partners, and thus easier respond to changes in

the environment, and most of all, quickly launch new biotechnology or pharmaceutical products. This model of cooperation can significantly contribute to the development of Polish biopharmaceutical industry as well as to creation of open innovation alliance network in the future. This issue will be further investigated by the research team in future research, which findings and results could be a starting point for recommendations, regarding different modes of cooperation and alliance management tools, for biopharmaceutical companies operating in Poland and CEE.

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