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BUSINESS MODEL IN RESEARCH-DEVELOPMENT ACTIVITY

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Summary

More and more premises suggest that maintaining positive trends in Polish economy won't be possible without changing the philosophy of activity which many companies follow. Taking into consideration the growing demands of clients and the market, globalization, which is strengthening competition, as well as the growing complexity of tools and production-service methods, it is not enough to continue building market position based on limitation of costs and lower product prices. Rising to the growing challenges, in particular, the challenges ahead of production-service units, will require a broad application of the achievements of science and technology to the processes of development. Even the biggest companies more and more often take advantage of the help of various partners, who support them in the process of introducing new solutions raising the efficiency of activities.

The partners and allies of business practice in the processes of modernization of the economy are scientific-research institutions, such as scientific institutes, research-development units and universities. A market on which companies can look for the solutions they need and scientific-research institutions can look for inspiration, partners and capital is being formed. The market provides conditions for operation, development and implementation of developed solutions. Taking into consideration the complexity of market, technical, legal, financial, or intellectual property protection issues, research-development units are more and more frequently unable to function efficiently without a clear and unequivocal definition of goals, methods and conditions of activity. Their market offer has to take into consideration not just scientific-research, or methodological aspects. Taking into consideration continuously growing demands of the clients and pressure of the competition, scientific-research institutions have to pay attention also to market, information, personnel, or financial aspects typical of strictly commercial ventures. What may support a comprehensive preparation and implementation of scientific-research activities under market conditions are tools successfully used in trade and economy, such as business models. These issues are the basis of deliberations contained in this work.

In order to make it easier for scientific-research institutions to work out models of conduct arranging activity and facilitating efficient functioning on the market, below attention is paid to the consideration of such issues as:

- the notion of business model in the economy and its components,
- characteristic features of research-development activity (R&D),
- the concept of components of business models in research-development activity,
- the essence of business model in research-development activity,
- benefits and conditions of using business models in research-development activity.

The paper ends with a summary - formulation of final conclusions.

Keywords: business model, research-development activity, market, relations with clients

The notion of business model

Business model in economy is not a new concept. More, or less formal definition of the ways of functioning on the market has always been the basis for companies' activity¹, especially in case of companies achieving success on the market. Defining business models became common in the 1990's, especially in companies using the Internet for various purposes in their activity. The reason for the popularity of defining business models is the will to guarantee income and profitability for commercial entities. This is what stimulated trials, as well as broader and broader process of shaping, comparing and perfecting business models of production-service companies functioning on the market. Achievements in this field stimulated broader and broader application of business models also in other areas of activity.

To define a business model in an unequivocal way based on the literature concerning it is hard, perhaps even impossible². What shows this is an overview of 66 definitions of the business model drawn up by T. Falencikowski³, which illustrates a huge diversification of approaches, as well as the essence of this concept, according to its authors. Without getting into details, it is possible to assume⁴ that the term "business model" means the way in which a company creates value for clients, which is strongly emphasized in the marketing approach to business and how it intercepts a part of this value. In simple terms, it is possible to conclude that business model responds to the question in what way a market entity, as a participant of commercial exchange, evaluates the created value and how it intercepts a part of it, taking appropriate remuneration. This comes from the assumption that the essence of business is generating profit. At the current stage of social-economic development it is assumed that along with value for the client, business model should be focused on providing value also to other stakeholders, especially shareholders. Describing the manner of utilization of possessed resources in the process of creating value for clients and generating, as well as continuous multiplication of revenues, business model highlights the foundations on which the market success of a commercial entity is based, or should be based.

To properly create and use a business model, it is important to understand the difference between business model and the strategy of a commercial entity. In simple terms, it is possible to conclude⁵ that a business model involves presenting what a company is, what it has at its disposal and how it functions. At the same time strategy defines what it wants to achieve and in what way. Thus, business model can be treated as the image of a company at a particular moment, at the same time strategy has the features of a flow characterized by the direction of changes, assessed afterwards, based on the consequences.

Company business model consists of a series of elements⁶, also defined as its components.

Elements of a business model have been discussed in detail by T. Falencikowski⁷, who mentioned 92 components named by various researchers. He allocated them to 50 groups concluding that by now experts haven't agreed on their opinions on the discussed area. For example, A. Osterwalder & Yves Pigneur, making an effort to work out a universal business model, distinguished the following components of a business model⁸:

- clients and market,
- proposition of value,
- business channels and providing value,
- key activities,
- relations with clients,
- streams of revenues,
- key resources,
- key partners,
- structure of costs.

The significance of the components of the business model of a market entity is discussed briefly in table 1. As the analysis of these components suggests, business model defines all most important factors making it possible to understand for whom, in what way, using what resources and to what effect business activities are conducted. Among the components of business model the following are also mentioned⁹:

Table 1. The significance of the components of the business model of a market entity

Component	Meaning
Clients and the market	People, companies and market segments that the market entity following a particular model wants to deal with
Proposition of value	Goods and services generating value for the served clients — target market of the market entity
Business channels and providing value	Methods of communicating with clients and market segments, providing them with the value proposition
Key activities	The most important actions that a market entity has to take in order to function efficiently
Relations with clients	The relations connecting market entity with the served clients — target market
Streams of income	The amount of funds generated by the market entity pursuing a particular business model thanks to serving clients — the target market
Key resources	The most important human resources (intellectual), physical (technical), informational and financial necessary for the proper functioning of a market entity
Key partners	Network of suppliers and partners securing efficient functioning of a market entity
Structure of costs	All expenses associated with the functioning of a market entity according to a particular business model

Source: Prepared on the basis of: A. Osterwalder & Yves Pigneur, *Business Model Generation*, John Wiley & Sons, Inc., Hoboken, New Jersey 2010, p. 24–45.

- the intensity of competition,
- distinguishing skills,
- capital model,
- market segments,
- structure of the chain of value,
- flow of information,
- sources of profit,
- competences,
- skills,
- risk,
- sold rights,
- protection of the business model,
- other elements.

Table 2. Most popular business model and their characteristics

Lp.	Name of the model	Description of the model
1.	Model sprzedawcy (shop keeper model)	Firmy zarabiają na tradycyjnej sprzedaży produktów tam, gdzie potencjalni klienci mogą dokonać zakupu
2.	Model „kija i marchewki” (bait and hook model)	Firmy oferują podstawowy produkt po niskiej cenie, zarabiając na sprzedaży akcesoriów uzupełniających (tonery, ostrza, taryfy, itp.)
3.	Model pośrednika (brokerage model)	Firmy zarabiają na prowizjach od transakcji realizowanych za ich pośrednictwem (np. serwisy aukcyjne, internetowe biura maklerskie)
4.	Model reklamowy (advertising model)	Firmy zarabiają na opłatach pobieranych od reklamodawców zamieszczających reklamy na ich stronach internetowych
5.	Model pośrednika informacyjnego (infomediary model)	Firmy zarabiają na sprzedaży zgromadzonych przez siebie danych o konsumentach, pomocnych obsługującym ich dostawcom
6.	Model kupca (merchant model)	Firmy zarabiają na sprzedaży produktów poprzez Internet (handel internetowy), nieraz w powiązaniu z tradycyjną działalnością handlową
7.	Model producenta (manufacturing model)	Firmy zarabiają na sprzedaży swoich produktów poprzez Internet, z ominięciem pośredników (skrócony kanał dystrybucji)
8.	Model sieci afiliowanej (affiliate model)	Firmy umieszczają na własnych stronach internetowych linki do stron innych podmiotów, oferujących produkty w Internecie, uzyskując od nich wpływy, o ile dzięki linkowi nabywca zakupi jakiś produkt
9.	Model wirtualnej wspólnoty (community model)	Firma zarabia dzięki silnej lojalności internautów wobec wirtualnej wspólnoty
10.	Model abonencki (subscription model)	Firma zarabia na pobieraniu opłat za dostęp do treści umieszczanej na stronach internetowych
11.	Model taryfowy (utility model)	Firma nalicza opłaty za faktyczne użytkowanie usług internetowych

Source: Own materials prepared on the basis of:

<http://pga.blox.pl/2007/05/Czym-sa-modele-biznesowe-i-jak-sie-je-definiuje.html> (March 25, 2015).

The above list suggests that depending on the approach to the model of business, the list of its components can vary a lot.

Under conditions of growing diversity of processes, structures and organizational solutions in the economy, many business models have been worked out. The most popular among them are presented in table 2. The analysis of these models makes it possible to conclude that many of them refer to a business activity, which involves mass copying of solutions which are often not very innovative and don't rely much on knowledge. They are

suitable for production-service companies as legally, organizationally and economically separate commercial entities carrying out comparably simple, schematic sets of repetitive tasks. The conditions and the manner of functioning of such companies differ substantially from the conditions in which research-development activity is carried out, which has an impact on their model of activity. Taking into consideration the necessity to adopt a different approach, in the latter part of this work the specific and distinct character of R&D activity in the aspect of its business model is discussed.

Characteristic features of research-development activity

The starting point for analyses and formulating structural-operative solutions concerning research-development activity under Polish conditions may be the act from April 30, 2010 on the rules of financing science, along with subsequent amendments¹⁰. According to the act , research-development activity is understood as "...creative activity covering scientific research, or development works, conducted in a systemic way for the purpose of raising the level of knowledge and taking advantage of the body of knowledge to create new applications"¹¹. Scientific research can be divided into:

- primary research, which means "...original research works — experimental, or theoretical — taken up in order to gain new knowledge about the foundations of phenomena and observable facts, without focusing on direct practical application, or utilization"¹² ,
- applied research understood as "... research works taken up in order to gain new knowledge, focused mainly on application in practice"¹³,
- industrial research, that is "...research aimed at gaining new knowledge and skills for the purpose of working out new products, processes and services, or introducing significant improvements to existing products, processes and services; this kind of research covers creating the components of complex systems, especially for the assessment of

usefulness of generic technologies, with the exception of prototypes covered by the scope of development works"¹⁴.

Development works involve "...purchasing, combining, shaping and using currently available knowledge and skills from the area of science, technology and business activity, as well as other knowledge and skills for the purpose of planning production, creating and designing new, changed, or improved products, processes and services, in particular:

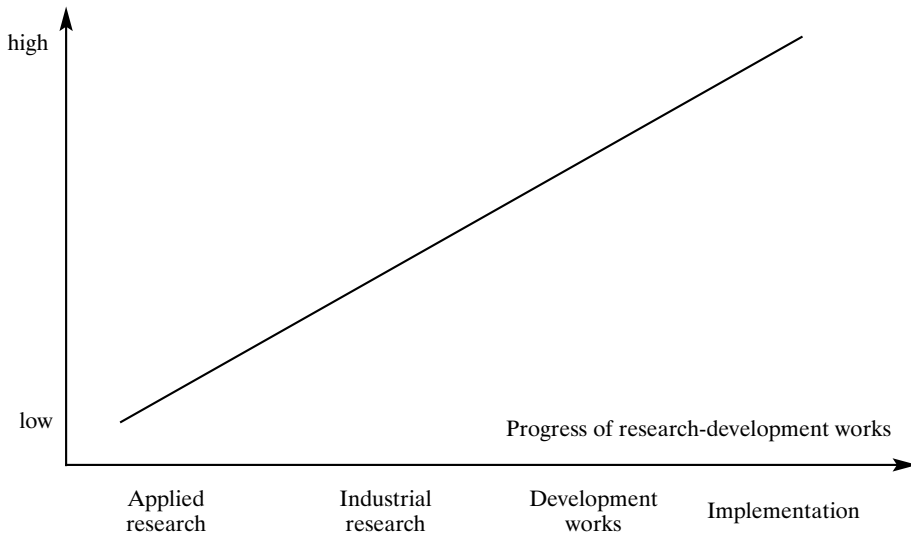
- a) creating projects, drawings, plans and other documentation for the creation of new products, processes and services, under the condition that they are intended for commercial purposes,
- b) working out prototypes with a potential commercial application, as well as pilot projects, (...),
- c) activity associated with experimental production and testing products, processes and services under the condition that they are not used for commercial purposes"¹⁵.

As the above suggests, except for primary research, almost every kind of scientific-research activity is focused on practical application and utilization. Under conditions of market economy it means that:

- every venture, or scientific-research project going beyond the theoretical acquisition of new knowledge should take into consideration the market context,
- planning and carrying out works in a scientific-research project correctly requires taking into consideration the market and business conditions,
- the required awareness of these conditions among the people carrying out research-development works should grow along with the progress of R&D works and the level of accuracy of developed solutions and as these solutions gradually take the shape expected in practice (picture 1).

The discussed kinds of research-development activities, especially aimed at practical applications, constitute normal elements and stages of the

Picture 1. Relation between the knowledge of market and business conditions and the progres of research works



Source: J. Koszałka, Rynek i model biznesowy działalności badawczo-rozwojowej w uczelni, not published work

process of innovation development. The common understanding of innovation is: "the implementation of a new, or significant product (product, or service), or process, new marketing method, or new organizational method in business practice, workplace organization, or relations with the environment"¹⁶ . In general, the more innovative the practical result of R&D works, the broader the required scope of research works and development activities. The following are examples of the results (products) of the innovation development process¹⁷:

- patent (invention),
- industrial design,
- utility model,
- technology,
- business model,
- software,

- know-how,
- research result,
- technical model,
- prototype,
- product,
- service (ordered research, expertise), etc.

Currently the growing degree of complexity of solved problems, as well as the technical-technological advancement of the methods of solving them leads to a situation in which the transformation of an idea of innovation into solutions implemented in practice is less and less often the result of activities conducted exclusively by business entities. It is just the opposite — more and more often independent organizations specialized in research and development, including universities, research-scientific institutes, technique and technology centres, or business support institutions. Their cooperation with companies is based on commercial rules and the results of their works more and more often become a subject of exchange on the market. Despite the fact that mutual cooperation is based on market conditions, it is possible to notice a series of differences between the activity of research-development organizations and the activity of manufacturing-service companies. This is shown by characteristic features of scientific-research activity mentioned below.

- Unique character of research-development activity, which stands in opposition to often routine activities, observed in case of many production-service processes, which forces the personnel conducting it to continuously learn, multiply knowledge and acquire new skills.
- The key importance of scientific-research and development competences of the personnel in chosen areas/disciplines, expressed by the ability to acquire, gather, apply and multiply knowledge, especially through applied research and development works, as well as exchange and discussion concerning their results in course of broadly understood cooperation with the scientific society.
- Applying specific scientific-research and measuring-control and using, often unique instruments and research-measuring equipment

associated with them.

- High uncertainty and risk associated with R&D activity substantially exceeds the average risk of production-service activity.
- The necessity to protect generated values and available intellectual property against illegal utilization.

The unique character of research-development activity has a strong impact on the mutual ties and influences of R&D entities, as well as their clients and partners, that is, relations. In business the relations between the participants of market exchange are shaped on the following levels¹⁸:

- basic — when the seller doesn't get in touch with the client after the sale of a product,
- reactive — meaning that after the sale the seller encourages the recipient to contact him in case of a need, that is, when problems with the utilization of a product requiring the intervention of the supplier arise,
- responsible — when after the sale the seller contacts the recipient to check whether the product meets his expectations and reacts according to the response,
- pro-active — this involves informing the client about new, potential areas of cooperation associated with modernization and/or expansion of the offer and/or own production-service capacity,
- partnership — when market entities cooperate on formation of the long-term goals of their activity and carry them out together.

Taking into consideration uncertainty and risk in research-development activity, especially in activity aimed at practical applications, it is possible to draw a simplified conclusion that it is associated with the technologies whose development is stimulated by R&D activity and with projects which contain R&D activity as one of their components. Technology is treated as "... science, or area of knowledge about the methods of processing resources, materials and objects, as well as about the methods of manufacturing ready products, also about machines, tools, equipment etc. serving the purpose of processing and manufacturing"¹⁹. Due to the influence of terminology used

in Anglo-Saxon countries the term technology currently means "applied sciences" and "science and technology" means exact and applied sciences. Technologies and innovations are more and more often the main way in which companies can gain competitive advantage on the market. From this point of view, taking into consideration the growing level of risk, there are the following categories of technology²⁰:

- basic, which is common in industry and offers small competitive advantages, improving it can be easily copied and mastered by the competition,
- crucial, which is the basis of competitive advantage of companies leading in a particular branch, giving them significant benefits when they use them more efficiently than their rivals,
- pace-setting (progressing), which means technologies at an early stage of development, which following development can successfully change the foundations of competition in the industry,
- emerging, that is, technologies with prospects for reformulating the foundations of competition in the long term.

It is possible to make a highly accurate conclusion that the risk associated with the preparation and implementation of technology is related to the level of readiness of technology understood as the current level of advancement of knowledge, science and technique in the world in the area of a particular technology in the aspect of easiness of its practical application. From this point of view in the analysis of technological solutions, in course of assessing diverse technological projects. Among others, at NASA nine detailed levels of readiness of technology divided into three groups have been identified, in particular²¹:

- low, when basic rules and characteristics of a phenomenon have been observed and recorded, the concept of technology and its future application have been defined, its crucial functions have been confirmed through experiments and analysis,
- medium, at which the components and/or basic subsystems of a technology are verified, at the beginning in laboratory conditions, later

in an environment close to reality with the demonstration of a prototype or a model of a system/subsystem of a technology under conditions close to real world conditions,

- high, when the prototype of a technology is demonstrated under real world conditions, research is completed and demonstration of the final form of the technology and when the technology has been successfully tested under real world conditions.

The issue of risk is regarded as particularly important in managing projects, especially with a high share of scientific-research activity. Among the considered kinds of risks²², there are technical, testing, Logistics, manufacturing, or engineering risks. What is often taken into consideration as a fundamental issue for a project is cost risk and deadline risk. Other categories of unpredictability are objective risk (defined on the basis of e.g. recorded experiences from earlier projects, assessment of documentation, or data about acquired results) and subjective risk (defined on the basis of e.g. interviews with experts), or external risk (outside control of the project manager) and internal risk (under control of the project manager). There is a whole range of methods of classification, identification, documentation and assessment of project risk²³, used for formulating the plan of risk management, which often constitutes a component of the project management plan.

Intellectual property, even though not precisely defined by law, is understood as "...rights related to literary, artistic and scientific works, (...) inventions in all areas of human activity, scientific activities, industrial designs, trade and service marks, as well as business name and markings, protection against dishonest competition and all other laws concerning intellectual activity in industrial, scientific, literary and artistic areas"²⁴. The effects of creative work, as intellectual property, are subject to protection, especially in the act on copyright and related laws from February 4, 1994²⁵. Copyright is the right of the creator (creators) of a work. The following categories can be distinguished:

- personal copyright which never expires and cannot be passed on to others and cannot be abandoned and

- the category of author's property right, which is sellable and can be transferred to other persons by means of inheritance, transfer contract, or utilization contract (license contract), usually with a remuneration for the creator.

The relations associated with ownership and protection of intellectual property, which require special procedures for gaining protection are regulated by the Act on industrial property right from June 30, 2000²⁶. The works²⁷ discussed below are subject to the procedures of registration, confirmation of authorship, originality of solutions and indicating the elements of novelty.

- Inventions are new ideas, or solutions to technical problems which don't exist on their own in nature (so-called artificial creations), which have to be new (they cannot be a part of the current state of technology), they have the so-called inventive level (they constitute a not obvious solution, which isn't a direct result of the state of technology) and they are suitable for industrial application (they make it possible to achieve a particular product, or highlight a method that can be used in industrial activity).
- Utility models are new and useful solutions with a technical nature which relate to the shape, construction or juxtapositions of objects of permanent form, including solutions which are resulting from the existing state of the art, with the period of validity of the protection rights of 10 years.
- Industrial designs mean new and unique forms of products, or their parts which are determined by the quality of their lines, outlines, shapes, colours, structures, or materials they are made of, as well as by ornaments, concerning in particular packaging and graphic symbols on products and/or packaging.
- Trademarks are graphic symbols used in order to distinguish products originating from different producers, in particular words, ornaments, shapes, colours, drawings, as well as sound signals, which are an important source of information for buyers, used, among others, for marketing purposes.

- Geographic designation is used to mark and distinguish products originating from and/or produced from resources from a particular territory, processed in particular conditions, according to specific, regional recipes, when there is a system controlling the adherence to these conditions and regulations.
- Integrated circuits understood as their original topography, which is under legal protection thanks to registration.

Confirmation of property rights and protection of the discussed works at the Patent Office of the Republic of Poland are guaranteed by²⁸:

- patent, in common understanding a document denoting monopoly, that is, exclusive right to use a solution subject to protection, granted for inventions regardless of the area of technology they belong to, for 20 years from the date of application,
- protection law, which authorizes the owner to exclusively use an industrial design also a trade mark, for commercial purposes on the territory of the whole country for 10 years from the moment of application,
- right from registration, which gives the owner of an industrial design the freedom to use it for commercial, or professional purposes on the territory of the whole country for 25 years from the moment of submission of the design to the Patent Office, with the obligation to pay a separate fee for every five-year period of protection; in case of geographic designation right from registration is granted for an indefinite period.

Two basic strategies are used for the protection of intellectual property, namely²⁹:

- defensive, when its essence is the protection of owned intellectual property and making it harder for rivals to gain access to attractive markets, technologies and products,
- offensive, when it involves creating conditions for development thanks to, among others, entering new markets, differentiating products or taking up new business strategies.

It is worth remembering in every situation that the goal of the strategy of intellectual property protection is not registering patents of inventions, but strengthening your own competitive position and actions serving this purpose.

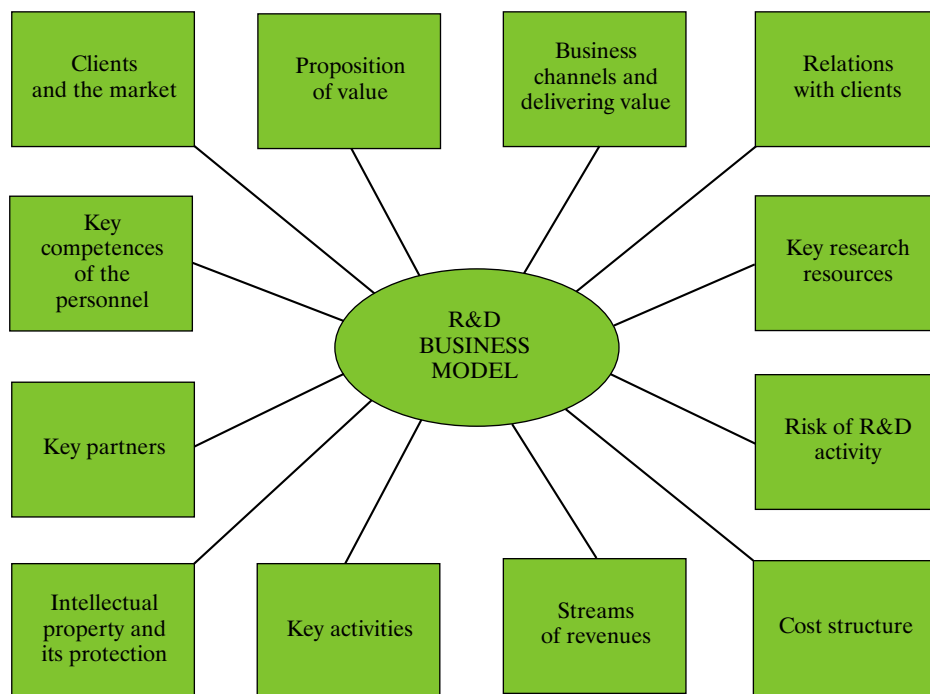
As the above shows, business models in research-development activity cannot be limited to direct choice and thoughtless utilization of business models prepared for commercial manufacturing-service processes. It seems reasonable to add elements taking into consideration key differences between research-development activity and classic production and sales of products and services to the business models of R&D entities. The concept of components and business models in research-development activity is discussed below.

The concept of business model components in research-development activity

In course of formulating business model concept for research-development activity, it is advisable to adopt a recognized business model worked out by A. Osterwalder and Y. Pigneur³⁰ for manufacturing-service activity, taking into consideration key features of the scientific-research and development processes, especially risk and the necessity to protect intellectual property. Thus, we can name the following as components of the business model of R&D activity (picture 2.):

- clients and the market,
- proposition of value,
- business channels and delivering value,
- relations with clients,
- key competences of the personnel,
- key research resources,
- key partners,
- risk of R&D activity,
- intellectual property and its protection,
- key activities,
- streams of revenues,
- structure of costs.

Picture2. Proposed components of a business model for R&D activity



Source: prepared on the basis of A. Osterwalder & Yves Pigneur, Business Model Generation, John Wiley & Sons, Inc., Hoboken, New Jersey 2010, p. 16–17.

In table 3 the meaning of the components of the business model of a R&D entity is explained, and its characteristics are taken into consideration. It is possible to add the following remarks to the content of table 3:

- As a rule, individual recipients (consumers) are not among the clients of scientific-research entities.
- What can constitute a proposition of value for the clients of an R&D entity, along with products and services, are such additional benefits, as originality and innovativeness of solutions, meeting research standards and technical-market standards, high quality of products, adaptation to individual expectations of the recipients, diligence, reliability and speed

of service, brand and status of the service-provider, certificates confirming compliance with expected requirements, efficiency of activities, etc.

- At the stage of looking for partners and establishing contacts, among important business channels and channels for delivering value are channels with the participation of agents, including local economic administration bodies and public media at the stage of preparation and exchange of value, maintenance and post-transaction cooperation — direct channels — Business to Business (B2B).
- Relations of an R&D entity with the served clients — target market — shouldn't be at a level lower than responsible level. In case of key clients it would be advisable to achieve the level of partnership in mutual relations.
- Among factors of crucial significance for the implementation of initial stages of research-development activity by an R&D entity there are: know-how and scientific-research competences of the personnel. The more advanced the research-development activities and the processes of innovation development, the greater the significance of technical skills, as well as skills associated with handling projects, management, cooperation with business partners and disseminating solutions.
- Technologies of research-development services and technical assets include rooms, infrastructure and equipment, devices, installations, laboratory and controlling equipment, tools, databases and appropriate software, necessary financial assets and other assets necessary for the proper functioning of an R&D entity.
- Key partners as a network of suppliers and partners, securing efficient functioning of a research-development entity should constitute a group particularly well adapted to the model of activity of a R&D entity. This is the source of the need for meticulous profiling of their composition in the context of current and especially future development plans/directions of activities of an R&D entity.
- It is possible to connect uncertainty and risk of scientific-research and development activity of an R&D entity with the category and level of readiness of technologies whose growth is stimulated by research-development activity, alternatively, with managing ventures which benefit from R&D activity.

Table 3. The meaning of the components of the business model of a R&D entity

Component	Meaning
Clients and the market	Organized recipients — manufacturing-service companies, institutions and government agencies, local administration and public institutions interested in preparation and implementation of innovative technical, organizational, marketing and business solutions
Proposition of value	The results of research and development works as products and services generating value for the client, enriched with additional benefits, raising the offered value
Business channels and delivering value	The ways an R&D entity communicates with clients and market segments and provides them with the proposition of value
Relations with clients	Relations connecting an R&D entity with the served clients — target market
Key competences of the personnel	Know-how and scientific-research skills in particular areas/disciplines associated with formulating and creatively solving research, technical, market-related and organizational problems
Key research resources	The possibility of using the technology of research-development technologies and assets necessary for the proper functioning of an R&D entity
Key partners	Network of suppliers and partners securing efficient functioning of an R&D entity and solving the investigated problems
Risk of activity	The areas of risk and uncertainty in scientific-research and development activity of an R&D entity, resulting from the possibility of emergence of unpredictable events causing positive and/or negative effects for its activity
Intellectual property and its protection	Kinds of intellectual property generating in course of functioning of an R&D entity and the adopted methods of protection
Key actions	Activities conducted in course of research-development work which are necessary to determine, produce and deliver value for the clients of an R&D entity in scientific areas and disciplines it is specialized in.
Streams of revenues	Assets generated by the modelled R&D entity thanks to serving clients — the target market
Structure of costs	Expenses associated with the functioning of an R&D entity based on the adopted business model

Source: prepared on the basis of: A. Osterwalder & Yves Pigneur, *Business Model Generation*, John Wiley & Sons, Inc., Hoboken, New Jersey 2010, p. 24–45.

- The methods of protection of intellectual property should be adapted to the value generated as a result of research-development activity, using both defensive and offensive strategy of protection depending on which more efficiently strengthens the competitive position of an R&D entity, as well as activities serving this purpose.
- Among key activities handled by an R&D entity in course of research-development activity — apart from carrying out tasks resulting from scientific-research and development processes in the scientific disciplines and areas chosen as its specialization — there are efforts related to cooperation with partners representing complementary scientific-research and development competences and in projects leading up to implementation in practice — cooperation with business partners, which is important particularly in case of complex R&D projects.
- What determines the stream of revenues in a research-development organization is the clients' assessment of the value of the proposed offer and methods of its delivery, expressed by, among others:
 - fees for research-development services,
 - sales of the products of R&D activity,
 - fees for sale of licenses,
 - fees for access and using the results of research,
 - fees for using databases,
 - advance payments for products and services, etc.

In case of databases their users are usually obliged to pay for a license³¹, purchasing a subscription with a fixed cost, or to pay fees depending on the scope of utilization of the database. Subscriptions can concern unlimited possibility of using the data of the license-provider, the possibility of access for a particular purpose, obligation to pay per use, or logging in, possibly a combination of those. What should be an important element of the revenues of an R&D entity is profit, as one of important sources of financing for investments in development.

Among the costs of functioning of an R&D entity there are:

- direct costs, when they can be calculated directly for the ready product,
- indirect, which are calculated by means of the so-called allocation key, e.g. the number of work hours, number of employees, or consumption of materials, most often are described as departmental and overhead costs, depending on the place of generation.

Breakdown of costs by type³²:

- materials (resources, materials, fuel, energy),
- amortization,
- personal (salaries, together with social insurance),
- others(e.g. rent, external services).

Regardless of the structure of costs of research-development activity and the methods of shaping it, it is important to adapt their level to the capacity of an R&D entity. The issue should be one of the most important criteria for the choice of the business model.

As the above deliberations show, there are significant reasons to talk of a specific character of business models in research-development activity.

Concept of business models in research-development activity

Taking into consideration the specific character and the conditions for the implementation of R&D processes, the following models, presented and described below, are proposed (Table 4).

- 1) The model of a seller of standard research-project and/or technical services — means that an R&D entity is offering reproducible research and/or project-technical products with known and recognized features, based on the utilization of unique competences of the R&D entity from

areas complying with its specialization and know-how and there is commercial demand for the products offered by the entity, e.g. *material stress tests, identification of chemical composition of products, certification of solutions, creating Internet websites, etc.*

- 2) The model of a seller of non-standard research-project services and/or technical services — it involves offering research results, inventions, patents, products, research services and/or project-technical services with non-standard features and method of implementation, with a significant share of research activities, as an answer to technical-commercial problems generally formulated by the clients, e.g. *studies on economic trends, market research and analysis, technical forecasting, researching the possibility of commercial usage of a particular phenomenon, working out a concept for a solution to a particular technical, manufacturing, market, or organizational issue, preparing a concept and/or investigating an innovative method of production, technical-marketing tests of a product, etc.*
- 3) Investor's model (*spin-off, spin out*) — concerns launching a business — *spin off, spin out* company offering innovative products, services, technologies, software, industrial designs, which are based on a concept created during an R&D entity's scientific-research and/or development activity, e.g. *launching the production of goods/services based on inventions, patents, industrial designs, utility designs, etc.*
- 4) Model of a manager of a research-development project and/or industrial consortium — means managing the process of solving complex technical-commercial problems requiring the cooperation of many partners with diversified scientific-research, social, technical, project and implementation-related competences, such as: *reclamation of degraded land, design and implementation of an environmental monitoring system, launching an early warning system, launching a traffic management system, etc.*
- 5) Model of a seller of training and consulting-expert services — it is associated with raising competences and supporting their buyers in the scope of preparation, implementation, monitoring, supervision and

assessment of goals, methods of execution and the results of production-service activity and/or development projects in the areas of an R&D entity's specialization, covering training and consulting-expert support for such ventures as e.g. *preparation and implementation of a company's marketing orientation and implementation of marketing research in a market-oriented company, implementation of goal-oriented management in an organization, launching quality management in a manufacturing-service company, implementing a system of computer support for the designing process, implementing computer-supported control over manufacturing-service processes, working out a project of creation and development of a complex company database, the development of negotiation skills of an organization's personnel* etc.

- 6) Model of an information agent — concerns collecting, arranging, analysis and assessment of scientific, economic, market and technical information, as well as one-off, periodical, or continuous delivery of information to the recipients (companies, central government and local government agencies, non-governmental organizations) in a form adapted to their needs such as e.g.: *information about events, economic reports and forecasts, branch publications — regional, national and international, reports of statistical offices and economic organizations (Central Statistical Office, Eurostat, OECD, UN agencies) research results and scientific reports, technical-economic innovations, publications of the European Commission, etc.*

Table 4. Simplified characteristics of business models in research-development activity

Name of the model	Characteristics of the model
Seller of standard research and/or project-technical services	<ul style="list-style-type: none"> • Clients: organized recipients, interested in reproducible research and/or project-technical products with well-known characteristics • Proposition of value: the result of R&D service, supported with a certificate proving compliance with recognized research-project standards, brand and status of the service-provider, diligence of activities • Channels: communication — B2B channels, providing value — direct channels • Relations with clients: responsible, or pro-active level • Competences of the personnel: know-how, scientific-research competences, the ability to serve the clients and the market • Key resources: rooms, necessary infrastructure, equipment, control-measuring equipment, databases and appropriate software • Key partners: recipients, comparably small • Protection of intellectual property: not necessary • Key activities: result from the technology of the service, require compliance with research and business standards • Streams of revenues: fees for research-development services, often from catalogues • Structure of costs: direct costs + indirect costs + profit
Seller of non-standard research-development i/lub technicznych	<ul style="list-style-type: none"> • Clients: organized recipients, interested in research results, inventions, patents, research and/or technical products with non-standard characteristics and method of execution, sometimes they act as co-creators of solutions (prosumers) • Proposition of value: the result of R&D service, usually containing a high share of innovative solutions, brand and status of the service provider, diligence of activities • Channels: communication — B2B channels, delivering value — direct channels • Relations with clients: responsible level, pro-active level, if possible, partnership level is the best • Competences of the personnel: know-how, scientific-research competences, ability to adapt to individual needs and conditions of each client, often within a cooperation network • Key resources: rooms, necessary infrastructure, equipment, control-measuring equipment, databases and appropriate software • Key partners: recipients, subcontractors with chosen, compatible competences, cooperation with them is based on close, personal relations • Risk of activity: high, depending on the stage of the R&D process and uniqueness of solutions • Protection of intellectual property: necessary, requires diligent negotiations • Key activities: individually defined with an adopted work plan, complying with research and business standards

Cont. table 4

Name of the model	Characteristics of the model
Investor (spin-off, spin-out)	<ul style="list-style-type: none"> • Streams of revenues: fees for research-development services, usually negotiated individually, in eligible cases — public support • Structure of costs: direct costs + profit • Clients: entrepreneurs, people interested in launching a business based on innovative solutions created in course of research-development activity • Proposition of value: commercial entity functioning in practice, in course of regular manufacturing service activity offers innovative products, services, technologies, software, which guarantee success and strong position on the market • Channels: direct • Relations with clients: responsible, pro-active level, partnership level is the best • Competences of the personnel: the ability to identify and analyse the market, connecting R&D activity with business practice, managing economic projects, providing client service • Key resources: research-development rooms, control-measuring equipment and access to production-service facilities, database and appropriate software, access to the distribution and sales network • Key partners: future recipients, intermediaries, supporting partners, central and local government control and supervision bodies, financial-insurance institutions • Risk of activity: very high • Protection of intellectual property: necessary, requiring accurate solutions worked out by all sides participating in the venture • Key activities: individually defined with an adopted venture implementation plan • Streams of revenues: private financing (e.g. business angels, seed capital SC, venture capital VC funds), public support (national and/or international programmes), payments made by the product buyers treated as the basic source of financing for the launched business • Structure of costs: individually defined by the venture's budget
Manager of an R&D project or/and industrial consortium	<ul style="list-style-type: none"> • Clients: organized recipients, interested in efficient implementation of complex technical-economic ventures • Proposition of value: carrying out the goals of a technical-commercial venture, often with a significant share of innovative solutions, brand and status of the manager, diligence of activities • Channels: direct • Relations with clients: responsible level, pro-active level, level of partnership is the best

Cont. table 4

Name of the model	Characteristics of the model
Seller of training and consulting-expert services	<ul style="list-style-type: none"> • Competences of the personnel: ability to manage complex technical-economic projects under market conditions, often within a framework of a network of cooperation, scientific-research competences in areas/disciplines crucial for the success of a project • Key resources: rooms, control-measuring equipment, databases and appropriate software, required by the project implementation plan • Key partners: investor/investors, beneficiaries of the project, subcontractors with chosen R&D competences • Risk of activity: very high • Protection of intellectual property: necessary, requiring accurate solutions worked out by the sides of the project • Key activities: individually defined with the project implementation plan • Streams of revenues: individually negotiated payments of the project buyers (investor/investors), in justified cases — public support (national and/or international programmes) • Structure of costs: individually defined with a project's budget <ul style="list-style-type: none"> • Clients: organized recipients, interested in improving own skills and consulting-expert support in manufacturing-service activity and/or carrying out own development ventures • Proposition of value: improvement of competences and lowering the risks associated with the clients' manufacturing-service activity and/or development ventures, brand and status of the service provider, diligence of activities • Channels: communication — B2B channels, delivering value - direct channels • Relations with clients: responsible level, pro-active level, level of partnership is the best • Competences of the personnel: substantial and training-consulting competences, based on the knowledge of the latest achievements and the knowledge about methods of work with people, the ability to identify training-consulting needs and aiming programmes of cooperation at the achievement of practical effects • Key resources: rooms, equipment and teaching equipment • Key partners: recipients, subcontractors with chosen R&D and training-consulting competences • Risk of R&D activity: comparably low • Protection of intellectual property: not necessary • Key activities: working out a training programme, preparing conditions for implementation, holding training and assessing its effects • Streams of revenues: fees for training-consulting services, services from an official catalogue and/or individually negotiated fees

Cont. table 4

Name of the model	Characteristics of the model
Information agent	<ul style="list-style-type: none"> • Structure of costs: fees for training-consulting services, usually negotiated individually, in eligible cases — public support • Clients: organized recipients with various profiles, status and expectations • Proposition of value: recipients get access to scientific, economic, market and technical information and knowledge from particular areas and disciplines of science in a form adapted to their needs, brand and status of the service-provider, diligence of activities, compliance with research and business standards • Channels: communication — B2B channels, delivering value — direct channels • Relations with clients: responsible, pro-active level, partnership level is the best • Competences of the personnel: the skill of collecting, arranging, analysis and assessment of information and knowledge from particular areas and disciplines of science and economy, the ability to serve the clients and the market • Key resources: rooms, access to databases, appropriate software, system of processing and delivering knowledge in form adapted to the needs of the recipients • Key partners: recipients, subcontractors with chosen competences from the scope of chosen areas/disciplines • Risk of activity: comparably low • Protection of intellectual property: usually not necessary • Key activities: defining the scope of gathered knowledge and profile of activity, choice of the sources of information, continuous collection of information, processing and providing knowledge in a form adapted to the needs of individual clients • Streams of revenues: license fees in form of subscriptions, regular, or depending on the scope of utilization of the database, according to a price list, or negotiated individually • Structure of costs: associated with current functioning of the knowledge database and associated with modification, development, adaptation of the current ones, or purchasing its new elements

Source: Prepared on the basis of J. Koszałka, Managing research-development projects at a university, unpublished work.

As the data presented in table 4 show, each of the models is distinguished by certain specific characteristics, which in a particular case result from the necessity to consider external and internal conditions for its functioning. In practice, every R&D entity can use one business model, or possibly their combination.

The subject of business models in research-development activity is complex, as it concerns many scientific, marketing, human, technical, economic and financial aspects. Expanding this subject and using the observations, conclusions and recommendation in economic practice requires further research and analyses, which exceeds the scope of this work.

Benefits and the conditions for the successful utilization of a business model in research-development activity

By forming business models and using them in their activity, research-development entities can achieve a whole range of benefits. Among the most important there are the following.

- Ordering the structure of functioning of R&D entities on the market, guaranteeing their wider opening to practical utilization of the results of research-development works in the economy and social life, as well as preparing and gathering assets for taking up and implementing them.
- Facilitating the choice of goals and areas of activity of R&D entity, leading to their concentration on problems, creating chances for specialization based on possessed scientific-research competences, held assets and adapted to the conditions in the environment, including risk of activity and protection of intellectual property.
- Identifying the desired directions of improving competences and the resources of research-development entities, appropriate for the chosen business model and making it possible to build competitive advantage on the market.
- Stimulating R&D entities to engage in complementary cooperation with partners for the purpose of boosting the capacity to handle bigger R&D and/or economic ventures of a complex nature, creating conditions for improving innovativeness of companies and whole sectors, as well as for improving the competitiveness of the national economy.

In order to achieve the expected benefits through introduction of a business model to the activity of a research-development institute, it is necessary to satisfy a whole list of conditions. The most important requirements are listed below.

- Actual elevation of the significance of implementations and cooperation between the sphere of science and the economy, in the parametrical assessment of research-development entities, units and teams, especially academic ones.
- The development of pro-market and pro-client orientation by the management and personnel of an R&D organization, units and teams, which is a condition for a better understanding of the needs of the economic sphere and the choice of the directions of research and economically useful implementations.
- It is necessary for the handlers of R&D processes to continuously monitor, analyse and assess the results of their activity and at the same time work out the methods of acquiring, collecting and using appropriate feedback within this scope.
- Continuous improvement of subject-related skills, but also of the business skills of the participants of research-development processes, especially associated with market research, segmentation and the choice of scientific-research and development plans, building durable relations with commercial entities, or economization of activities.
- Continuous improvement of own business model, as well as readiness to change it, or simultaneously use various business models depending on the changes of the scientific-research potential of an R&D entity and changing market environment.
- Appreciating the necessity to build and look after partner relations not only between the participants of research-development processes from the sphere of science, but also with partners from the sphere of economy, by definition interested in achieving practical effects of the conducted works and possessing funds for their implementation.

As the above points show, the benefits from the implementation of a business model in a research-development entity may be significant. However, achieving

these benefits requires satisfying numerous conditions and continuous efforts of all participants of the research-development processes and those who determine the course of these processes.

Summary

— Formulation of final conclusions

The discussion concerning business models in research-development activity can be summed up with the following final conclusions.

- 1) Business model is a term defining the way in which a company creates and delivers value to the clients and how it captures a part of the value in form of adequate payment. Taking into consideration the volume of funds invested in entities operating in the scientific-research sphere, more and more often commercial conditions of functioning and the importance of the results of their work for the competitiveness of manufacturing-service companies, it is possible to conclude that no economy can ignore the necessity to introduce efficient models of functioning, including business models, to the R&D sphere.
- 2) Business models of R&D entities have to take into consideration the differences between research-development and manufacturing-service activity expressed with, among others, the significance of knowledge in solving problems, higher risk of undertaken ventures, the necessity of protecting intellectual property, or the need to connect scientific-research knowledge with knowledge about the economy.
- 3) Business models of R&D entities should also take into consideration such elements as clients and the market, offered values, channels of delivery, relations with clients, key competences of the personnel, research resources, key partners, risk of R&D activity intellectual property and its protection, key activities, streams of revenues and the structure of costs.
- 4) It is proposed to define six business models reflecting various roles that research-development entities play: seller of standard research-project and/or technical services, seller of non-standard research-project and/or

technical services, investor, manager of a research-development project and/or an industrial consortium, seller of training and consulting-expert services, as well as information broker.

- 5) What should be one of the benefits of the implementation of a business model is above all wider opening of R&D entities to practical utilization of the results of their work, focus on problems creating chances of specialization based on the possessed scientific-research competences and resources, as well as adaptation to the needs and conditions of the market, highlighting the desired directions of improving activity, as well as encouraging cooperation with partners, also business, for the purpose of improving economic results and competitiveness of companies, regions and country, as well as own situation of R&D sphere players.
- 6) Among the conditions for successful utilization of a business model in research-development activity we can name actual elevation of the significance of implementations in the assessment of R&D entities, especially academic ones, the development of pro-market and pro-client orientation of their management and personnel, the necessity to continuously monitor and assess the results of own activity, continuous improvement of subject-related and business skills, as well as the business model, also appreciating and looking after relations in the cooperation of partners from the spheres of science and economy.
- 7) The subject of business models in research-development activity concerns many scientific, marketing, human, technical, economic and financial aspects. That's why expanding this subject and using the observations, conclusions and recommendations in practices of R&D entities requires further research and analyses.

Przypisy

¹ The term "company" means a unit running business activity, which is a separate legal, organizational and commercial entity. "Company" is the name under which a natural, or legal person runs a business. In practice, in market economy these terms are used in the same meaning as "commercial entity" or "market entity".

² Business models have been discussed by, among others: M. Bąk, P. Kulawczuk, A. Szcześniak (ed.), *Modele biznesowe przedsiębiorstw tworzonych na bazie szkół wyższych*, Instytut Badań nad Demokracją i Przedsiębiorstwem Prywatnym, Warszawa 2011; T. Gołębiowski, T.M. Dudzik, M. Lewandowska, M. Witek-Hajduk, *Modele biznesu polskich przedsiębiorstw*, Szkoła Główna Handlowa w Warszawie, Warszawa 2008; A.J. Sływotzky, D.J. Morrison, B. Andelman, *Strefa zysku*, PWE, Warszawa 2000; A. Osterwalder, Y. Pigneur, *Tworzenie modeli biznesowych*. Podręcznik wizjonera, HELION, Gliwice 2012; A. Jabłoński, *Modele biznesu*

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³ T. Falencikowski, Spójność modelu biznesu. Koncepcja i pomiar, CeDeWu, Warszawa 2013, p. 23–34.

⁴ Prepared on the basis of: T. Falencikowski, Spójność modelu biznesu. Koncepcja i pomiar, CeDeWu, Warszawa 2013, p. 37.

⁵ Prepared on the basis of T. Doligalski (scientific editor), Modele biznesu w Internecie. Teoria i studia przypadków polskich firm, Wydawnictwo Naukowe PWN SA, Warszawa 2014, p. 23–24.

⁶ The elements constituting a business model have been discussed by such authors as: T. Gołębiowski, T.M. Dudzik, M. Lewandowska, M. Witek-Hajduk, Modele biznesu polskich przedsiębiorstw, Szkoła Główna Handlowa w Warszawie, Warszawa 2008, p. 19–31; A.J. Sływotzky, D.J. Morrison, B. Andelman, Strefa zysku, PWE, Warszawa 2000, p. 53–99; M. Duczowska-Piasecka (ed.), M. Poniatowska-Jaksch, K. Duczowska-Małysz, Model biznesu. Nowe myślenie strategiczne, Difin, Warszawa 2013, p. 132–142; T. Doligalski (scientific editor), Modele biznesu w Internecie. Teoria i studia przypadków polskich firm, Wydawnictwo Naukowe PWN SA, Warszawa 2014, p. 20–23 and others.

⁷ Prepared on the basis of: T. Falencikowski, Spójność modelu biznesu. Koncepcja i pomiar, CeDeWu, Warszawa 2013, p. 51–53.

⁸ Prepared on the basis of: A. Osterwalder & Yves Pigneur, Business Model Generation, John Wiley & Sons, Inc., Hoboken, New Jersey 2010, p. 16–17.

⁹ Prepared on the basis of: T. Gołębiowski, T.M. Dudzik, M. Lewandowska, M. Witek-Hajduk, Modele biznesu polskich przedsiębiorstw, Szkoła Główna Handlowa w Warszawie, Warszawa 2008, p. 21–32; M. Duczowska-Piasecka (ed.), M. Poniatowska-Jaksch, K. Duczowska-Małysz, Model biznesu. Nowe myślenie strategiczne, Difin, Warszawa 2013, p. 147–148; T. Falencikowski, Spójność modelu biznesu. Koncepcja i pomiar, CeDeWu, Warszawa 2013, p. 52–53.

¹⁰ <https://ncn.gov.pl/sites/default/files/pliki/ustawy/ustawa-o-finansowaniu-nauki.pdf> (March 26, 2015).

¹¹ Ibidem, p. 2.

¹² Ibidem, p. 1.

¹³ Ibidem, p. 1.

¹⁴ Ibidem p. 2.

¹⁵ Ibidem, p. 2.

¹⁶ Prepared on the basis of: OSLO Manual. Guidelines for Collecting and Interpreting Innovation Data, OECD, European Communities 2005, p. 48.

¹⁷ Prepared on the basis of: J. Koszałka, J. Pniewska, D. Kuźniewski, Innowacje jako przedmiot obrotu rynkowego, *Marketing i rynek*, nr 3/2014, część II, Artykuły na płycie CD, p. 288.

¹⁸ Prepared on the basis of Ph. Kotler, Winning through Value Oriented Marketing, Seminar, Marketing Institute of Singapore, January 28, 1994 [in:] A. Drapińska, Zastosowanie marketingu relacji, [in:] M. Daszkowska (ed.), *Marketing. Ujęcie systemowe*, Wydawnictwo PG, Gdańsk 2005, p. 177.

¹⁹ T. Pszczołowski, *Mała encyklopedia prakseologii i teorii organizacji*, Ossolineum, Wrocław, Warszawa, Kraków, Gdańsk 1978, p. 246.

²⁰ Prepared on the basis of G. Stonehouse, J. Hamill, D. Cambell, T. Purdie, *Globalizacja. Strategia i zarządzanie*, Felberg SJA, Warszawa 2001, p. 184.

²¹ Opracowano na podstawie K. Santarek (ed.), *Transfer technologii z uczelni do biznesu. tworzenie mechanizmów transferu technologii*, PARP, Warszawa, wrzesień 2008, p. 88.

²² H. Kerzner, *Project Management. A Systems Approach to Planning, Scheduling and Controlling*, John Wiley & Sons, Hoboken NJ 2013, p. 885–886.

²³ H. Kerzner, *Project Management. A Systems Approach to Planning, Scheduling and Controlling*, John Wiley &

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²⁴ Opracowano na podstawie K.B. Matusiak (ed.), *Innowacje i transfer technologii. Słownik pojęć*, PARP, Warszawa 2008, p. 371.

²⁵ *Journal of Laws* from 1994, number 24, point 83.

²⁶ *Journal of Laws* 2001, number 49, point. 508, also Act on protection of databases from July 27, 2001 (*Journal of Laws* 2001, number 128, point. 1402) and act on counteracting unfair competition from April 16, 1996 (*Journal of Laws* from 1996, number 47, point 211).

²⁷ Prepared on the basis of K. Santarek (ed.), *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, PARP, Warszawa, 09.2008, p. 44–47.

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²⁹ Prepared on the basis of K. Santarek (ed.), *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, PARP, Warszawa, 09.2008, p. 60–62.

³⁰ Prepared on the basis of A. Osterwalder & Yves Pigneur, *Business Model Generation*, John Wiley & Sons, Inc., Hoboken, New Jersey 2010, p. 16–17.

³¹ Prepared on the basis of <https://moodle.umk.pl/BU/mod/book/view.php?id=111&chapterid=290> / May 16, 2016 r./

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