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## **INNOVATIVE STRATEGIES AS A DETERMINANT OF ACHIEVEMENT OF THE GOALS OF ENTERPRISE ACTIVITY**

### **Abstract:**

The theoretical and empirical investigations presented in the study are focused on the analysis of cause-and-effect relationships between innovative strategies and achievement of the goals of enterprise's activity. The importance of the problems discussed results mainly from the role performed by the innovative activities of enterprises in achievement and reinforcing the competitive advantage and position in a specific entity. Maintaining of the competitive position achieved by the enterprise necessitates not only adequate adjustment to changes that occur in the market but also having the ability to create these changes. Therefore, innovativeness is becoming necessary for competing under contemporary market conditions. With regard to variety and complexity of the problems of the goal of enterprise's activity, the study emphasizes the importance of the concept of value creation, which represents a strategic tool for managing enterprises. However, the empirical studies have demonstrated a dominant role of revenues on sales as a principal aim of enterprise's activity. The study verified the research hypothesis which assumed that the increase of innovativeness of enterprises leads to the increase in revenues on sales. Empirical investigations were carried out based on the data contained in statistical yearbooks of the Central Statistical Office for the years 2005-2012. A logit model was used in order to examine the relationships between the percentage of enterprises which implemented innovations and revenues on all the activities of enterprises.

### **Keywords:**

goals of enterprise's activity, innovative strategies, revenues on sales, value creation

**JEL Classification:** D22, D46, O31

## 1. INTRODUCTION

Innovations are a multifaceted and multidimensional problem. The legitimacy of this statement is reflected by both broad range of definitional and interpretational views to the concept of innovation presented in the literature and the plethora of scientific publications in this area. They represent an interdisciplinary category discussed and analysed from various research standpoints. The concepts concerning innovative activities relate usually to searching for new combinations of factors of production and flexible responding to changes in the complex and dynamically changing environment. Innovations are becoming a standard for behaviour of modern enterprises which are successful in the competitive market.

One of the main factors that affect the effectiveness of carrying economic activities is technological advances. T. Kośmider (2010) emphasizes that, particularly in the era of rapid changes and turbulent environment, innovativeness is becoming a key element to improve performance and economic growth. B. Nogalski (2010) stresses that contemporary enterprises are undergoing continuous changes, with their dynamics forcing companies to search for and learn new forms of organization, management, introduction of new ideas and new instruments that improve the process of these changes. In the reality dominated by developmental challenges, formulation, creation and introduction of new concepts, solutions and ideas is becoming the prerequisite for economic activities. The innovative activities contribute to creation of value added and strengthening competitive capabilities in both microeconomic and macroeconomic terms.

## 2. INNOVATIVENESS IN ENTERPRISES: IMPORTANCE AND SYMPTOMS

Innovative activities in enterprises are a very broad concept which relates to activities of scientific, technological, organization and financial character. With respect to the importance of innovative activities, one should emphasize a broad and ambiguous character of the context of this problem that functions within the common approach and the multitude of definitional views to the problems of innovations presented in the literature. In general, the concept of innovation in general terms is defined as something new, or implementation of something new or something improved in a specific area. Among the semantic approaches to this concept, one can find the views that deal with these problems in general terms and those that relate the problem of innovations directly to the area of enterprise operation. One example of the former is the view of J. Duraj and M. Papiernik-Wojdera (2010), who associated this concept with the results of human resourcefulness, ability to discover and formulate the laws, rules and create new concepts, solutions and ideas in order to realize and popularize them. In the latter context, innovations can be understood to mean application of new knowledge in the production process (see e.g. Begg, Fischer, Dornbusch 2000), and the principal change of the present status into the new one, which improves the effectiveness of enterprise operation (see e.g. Jasińska 2005). Using these views, one should emphasize that innovations can have varied character.

Under present market conditions, innovativeness is viewed as one of the principal components of enterprise competitiveness. This view can be found in a variety of publications and scientific studies. D. Nobelius (2004) notes that the success in implementation of new technological solutions, which manifests in the speed and precision of commercialization, is connected with the opportunities for achievement of greater share in the market and winning the competitive advantage. A similar approach was expressed by M. Haffer and R. Haffer (2004) who suggested maintaining and improvement in competitive position of the enterprise in the market can take place mainly through successful innovative activities. M. Nowicka-Skowron

and P. Pachura (2009) pointed to innovations as a contemporary paradigm of economic and social growth which determines the competitiveness and developmental potential of the enterprises. Furthermore, these authors emphasized the more and more popular belief that highlights the comprehensiveness of the concept of innovation, which is currently connected with creation and application of new knowledge in order to achieve competitive advantage.

Using similar context, J. Nowakowska-Grunt (2011) explores the importance of innovative activities in winning the competitive position by enterprises and emphasizes that active participation in global economy forces enterprises to build competitive advantage. The concept of control over new markets and satisfying increasing and more sophisticated needs and expectation of the customers is becoming possible through e.g. dynamic development of information technology, necessity of reducing the costs of activities, development of new technologies and methods of management as well as stressing the costs of investments and R&D. Furthermore, H. Kościelniak and S. Łęgowik-Świącik (2014) find that the onset of innovations forces the competitors to make immediate decisions which allowed for maintaining and achievement of advantage under conditions of market competition. Therefore, it should be observed that innovative activities of other entities force enterprises to start specific activity and they stimulate and motivate for further operation. B. Nogalski (2009) emphasizes that active enterprises are becoming a factor that makes the situation in the sector more dynamic, thus challenging other participants of the market play who are forced to adapt to the situations formed through innovations. Similar views were expressed by M. Romanowska (2010), who argued that active enterprises respond with innovative activities, which fills the gap between the organization and changes in the environment. Organizations are being forced to search for new solutions if they plan to achieve the competitive advantage. It can be concluded that innovations cause not only the increase in productiveness but they also contribute to economic development as a result of increasing the variety and quality of products and services, thus improving the competitiveness of enterprises.

Therefore, innovative activities in current enterprises are of multifaceted character. One example to support this statement is the view by Hutten-Czapski, Dmowski and Mrozowski (2014), who pointed to searching for new markets (including foreign markets) as another aspect of innovativeness which is equally important as implementation of new production technologies. However, these authors emphasized continuous topicality of the theories proposed by J. Shumpeter, who regarded innovations as a "flywheel" which drives changes and economic growth. Furthermore, the principal characteristics of contemporary innovations include first and foremost (Interim Report On The OECD Innovation Strategy, 2009) the necessity of involvement of a relatively high number of participant in the process of innovations, crossing a variety of areas of knowledge, creation of innovative activities within varied mechanisms and the course of the process of innovations within varied environments (e.g. research consortia, centres for technology transfer, technological platforms). It should be emphasized that the phenomena which accompany operation of contemporary enterprises affect the complexity of management of innovative processes expressed in integration of knowledge, skills and technological, production and organizational competencies of enterprises, which are connected through a feedback to the needs, preferences and behaviours of market participants.

J. Duraj and M. Papiernik-Wojdera (2010) demonstrate that the generic approach to problems of innovations justifies adoption of the assumption about the two principal analytical perspectives of its essence, which have result-based and process-based aspects. Innovative activities concern both new products and production processes as

well as innovations in the social area of the enterprise that concerns relations with other market participants and values that can be obtained by customers. With regards to this multifaceted nature, the way the innovation is perceived by the individual who implements the innovation is becoming essential. A. Jasińska (2005) distinguishes between the two principal roles of innovative activities for the enterprise: the external and internal role. The importance of the latter consists in creation or adaptation to new values, creation and utilization of market opportunities, creation or adaptation to conditions of other market participant or strengthening or maintaining the competitive position. Furthermore, using the internal context, innovations should help ensure internal flexibility of operation under unsteady conditions of the environment, lead to strengthening of vertical and horizontal integration of the processes performed in the enterprise, stimulate ability to adapt internal processes to the expectations of the environment and support opportunities for enterprise's learning. Innovations should lead to a principal change in the status of the enterprise into a new one, which improves its effectiveness of operation. They can be attributed varied importance in enterprise's activity.

However, it should be noted that innovative activity carried out by business entities can, depending on the final effect, have different character. This activity can be completed with a successful implementation of the innovation, innovation being implemented or abandoned before implementation of innovation. C. M. Christensen (2010) pointed to principal factors connected with failure to implement innovation by the enterprises which are leaders in their sectors and have firm competitive position. According to this author, the causes of failures can be regarded in three planes. The first of them is emergence of technologies which stop development of a sector which, contrary to continuation technologies that stop continuity of development, have usually worse performance parameter compared to the products with stable position, but they have other properties valued by a marginal number of customers. A characteristic feature of these products is that they are cheaper, simpler and often more comfortable in use. However, such technologies, which are connected with reduction in functionality of products, can contribute to deterioration of the market position of a specific enterprise. Furthermore, the second aspect of failures concerns excessive rate of technological progress compared to changes in market needs. With this respect, through innovations used, manufacturers offer products that go beyond the market demand. This means that implementation of new technologies is faster than demand in the market. In the third case, failures connected with innovations are caused the lack of willingness to take risk of investments in technologies which break the continuity of development. Therefore, this is the opposite that the first of the above causes of failures in innovative activities. It is also important that, under current unstable conditions of operation of enterprises, the principal role is played by both time of creation and absorption of innovations.

### **3. DETERMINANTS OF INNOVATION ACTIVITIES IN ENTERPRISES**

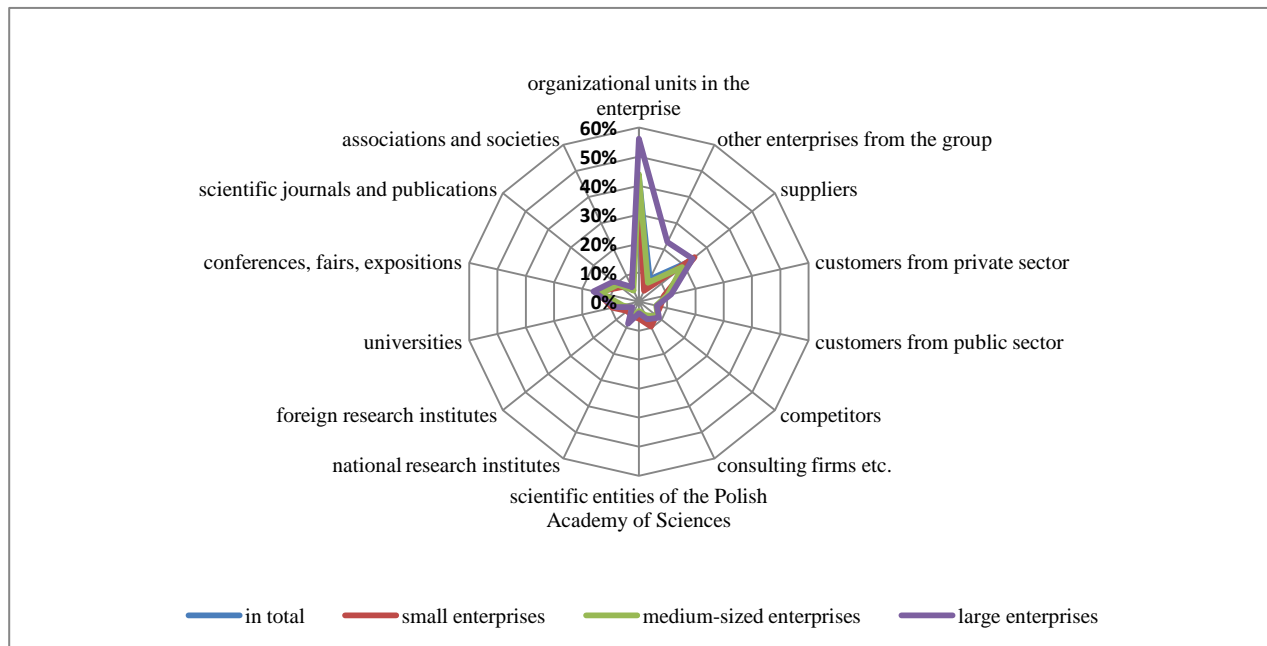
M. Kotsemir and D. Meissner (2013) note that, with current conditions, innovative activities are carried out based on cooperation between different institutions and utilization of knowledge from various sources. Therefore, achievement of the demanded position in a competitive environment necessitates inclusion of both internal and external determinants of enterprise operation in the areas of management of innovative processes. The table below presents four general categories of sources that might represent the basis for information for innovative activities of the enterprise.

Table 1. Sources of information for innovative activities in enterprises

<b>Sources of information for innovative activities in enterprises</b>	
<b>internal sources</b>	- organizational units in the enterprise (e.g. research and development, managers, sales division, marketing division etc.) - other enterprises included in the same group
<b>market sources</b>	- suppliers - customers (from private and public sector) - competitors and other enterprises from the same sector - consulting firms, laboratories, R&D institutions
<b>institutional sources</b>	- scientific entities of Polish Academy of Sciences - national research institutes - foreign research institutes - universities
<b>other sources</b>	- conferences, fairs, expositions - scientific journals and publications - scientific, technological, specialized and occupational associations and societies

The above market-based and individual sources are of external character and represent different entities which can participate in cooperation between organizations within the innovative activities. Therefore, it can be concluded that considering a specific source of information about innovations as of key importance to the enterprise reflects its preferences of cooperation in the area of innovation. Further analysis verified manifestations of conditions of innovative activities with regard to the sources that represented information for innovations in enterprises. The diagrams below present a percentage share of enterprises which regard a specific source of information as essential with respect to the general of enterprises which are active in innovations. These relations are presented with division into small, medium-sized and large industrial enterprises (Diagram 1) and enterprises from the sector of services (Diagram 2). The reason for division into small, medium-sized and large enterprises was methodological classification based on the number of employees (i.e. small enterprises: 10 to 49 employees; medium-sized enterprises: 50-249 employees; large enterprises: 250 and more employees).

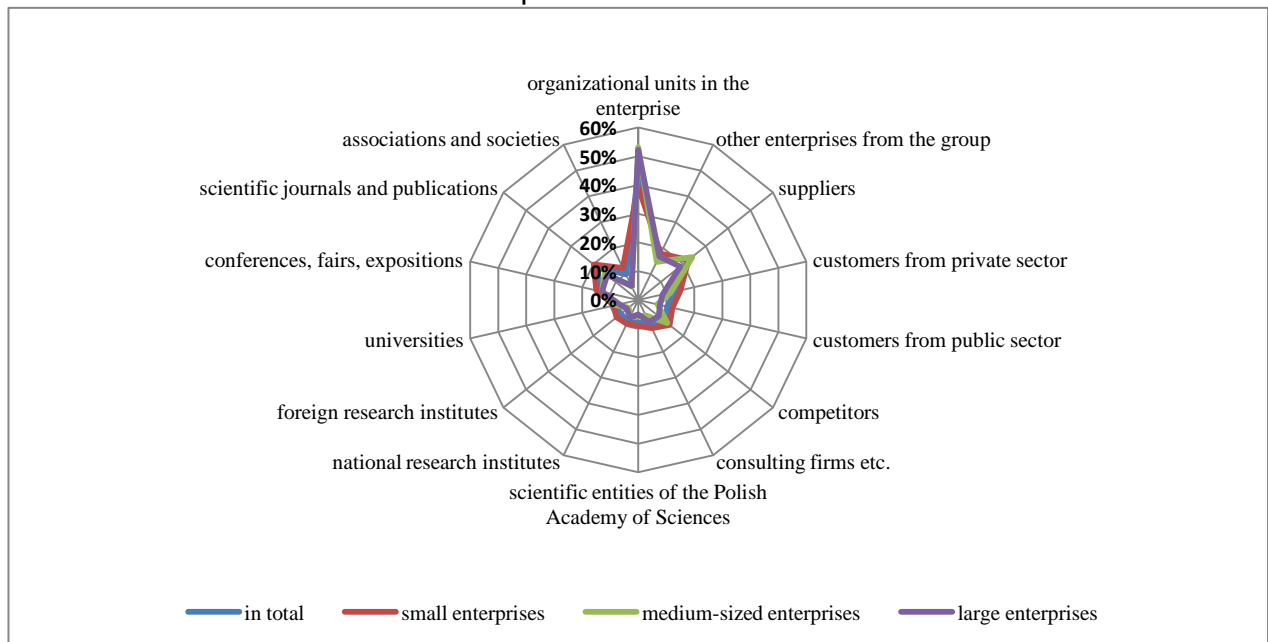
Diagram 1. Sources of information about innovations preferred by industrial enterprises in Poland.



Source: author's own elaboration based on: GUS. 2013a, p. 110.

Analysis of the above diagram demonstrates that the most important sources of information in all the industrial entities studied were organizational units in the enterprise. Among other external sources, the dominant importance to the enterprises was from exchange of information with suppliers. High importance was also attributed to conferences, fairs and expositions. However, smaller importance was attached to the information from foreign research institution. Furthermore, it should be emphasized that, regardless of the size of the enterprise, there was similar evaluation concerning the importance of a specific source of information about innovations. The noticeable discrepancies are observed only for preferences of large enterprises that relate to usefulness of internal sources. Large entities typically regarded their own organizational units and other enterprises from the group as highly essential sources of information about innovations.

Diagram 2. Sources of information about innovations preferred by service-providing enterprises in Poland



Source: author's own elaboration based on: GUS. 2013a, p. 111.

Analysis of the contribution of service-providing enterprises which evaluated importance of a specific source of information about innovations as very important compared to the total of innovation-oriented enterprises demonstrates that these organizational divisions in these enterprises also play a dominant role. High importance of this source of information about innovations was observed for 45% of all the entities studied. The enterprises from the sector of services also appreciate relationships with both suppliers and enterprises from the same group. Among other sources, the highest importance of information about innovations was attributed by journals, scientific publications and conferences, fairs and exhibitions. With regard to the willingness to exchange information about innovations with external entities, it should be emphasized that about 10% of service-providing enterprises found competitive entities and customers as very important sources. In conclusion, it should be indicated that the enterprises studied mainly preferred internal sources of information about innovations. Finding external sources as important was indicated by fewer than 25% innovation-oriented entities.

#### 4. ANALYSIS OF THE STATUS OF INNOVATIVENESS IN ENTERPRISES

Innovativeness of enterprises was analysed using the two principal aspects: innovation-oriented enterprises and innovative enterprises. Division into the size of the enterprises according to the number of employees was used in both cases. The innovative-oriented enterprises were those which implemented at least one product or process-related innovation or at least one innovation entity which was not completed in the period studied. Further, the innovative enterprise was understood to mean the entity which implemented at least one product or process information (new or significantly improved product or process). These relations were presented with division into small, medium-sized and large industrial enterprises and enterprises from the sector of services (see GUS, 2013). Table 1 presents the results of the analysis of innovativeness of enterprises which presents the percentage contribution of innovative enterprises compared to all the enterprises.

Table 1. Innovative enterprises in 2010-2012 in Poland

	<b>industrial enterprises</b>	<b>service-providing enterprises</b>
<b>Total</b>	17%	12%
<b>small enterprises</b>	10%	10%
<b>medium-sized enterprises</b>	29%	21%
<b>large enterprises</b>	56%	45%

Source: author's own elaboration based on: GUS. 2013a, p. 35.

Analysis of the above data shows that the leaders in innovative activities were large enterprises. Over 55% of industrial entities and almost 45% of those from the sector of services can be regarded as innovative. The noticeable difference can be also observed between medium-sized enterprises. The innovativeness in this case can be reported among 20% and 30% of service-providing and industrial enterprises, respectively. Furthermore, small enterprises show a level of innovativeness of nearly 10%.

Table 2 presents the data concerning the percentage number of industrial and service-providing enterprises regarded as innovative enterprises compared to enterprises in general.

Table 2. Innovation-oriented enterprises in 2010-2012 in Poland

	<b>industrial enterprises</b>	<b>service-providing enterprises</b>
<b>Total</b>	18%	14%
<b>small enterprises</b>	10%	11%
<b>medium-sized enterprises</b>	31%	23%
<b>large enterprises</b>	59%	44%

Source: author's own elaboration based on: GUS. 2013a, p. 30.

In large entities (which employ at least 250 people), innovative activities are performed with substantially higher intensity than in small and medium-sized enterprises. In this case, nearly 45% of service-providing enterprises and over 56% of industrial enterprises can be regarded as innovative (i.e. the enterprises which implemented at least one product or process innovation (new or significantly improved product or process). Furthermore, the innovation-oriented enterprises (those which implemented innovative projects which were not necessarily completed) include almost 50% of service-providing enterprises and almost 60% of industrial enterprises.

Nevertheless, innovative activities are often activity is often performed within complex structures which are often not available to individual enterprises. The research and organizational potential of enterprises which want to carry out innovative activities is insufficient for their independent performance. Therefore, it becomes necessary to improve openness of enterprises to cooperation and acting together. Furthermore, it should be emphasized that implementation of innovative solutions in enterprises leads to formation of numerous relations with enterprise's environment and, consequently, ensures higher permeability and extension of traditional limits of the enterprise.

Evaluation of innovative activity of enterprises was carried out based on the analysis of the structure of outlays on innovations carried out by industrial enterprises and



service-providers. The above identifiers reflect intensification and directions of innovative activities of the enterprise. Any activity carried out by a particular entity necessitates outlays, including the innovative activity. This is usually determined by the necessity of using technologies that generate costs of modern technologies, purchase of software or internal specialist support. The level of outlays on innovative activity is one of the principal criteria used for evaluation of enterprise's innovativeness. The resources used for this purpose can be classified according to different types of innovative activities. The empirical data that reflect these problems in industrial and service-providing enterprises were presented in Tables 3 and 4.

Table 3. Structure of outlays on innovative activity in industrial enterprises in 2008 – 2012 in Poland

	2008	2009	2010	2011	2012
<b>R&amp;D</b>	8.1%	10.2%	14.6%	13.5%	16.9%
<b>acquisition of external knowledge</b>	1.1%	1.3%	4.1%	1.3%	3.2%
<b>acquisition of software</b>	1.5%	1.7%	2.0%	2.2%	1.9%
<b>capital outlays on fixed assets</b>	84.7%	84.0%	74.8%	77.4%	73.6%
<b>staff training connected with innovation activity</b>	0.9%	0.2%	0.4%	0.3%	0.2%
<b>marketing for new and significantly improved products</b>	2.4%	1.6%	2.0%	2.3%	2.3%

Source: author's own elaboration based on: GUS. 2013b, p.138.

The data above allow for observation that the highest value of outlays on innovative activities in industrial enterprises was used on fixed assets. In 2008 and 2009, these outlays represented over 80% of the value of all the resources utilized for this purpose. However, a noticeable declining tendency can be observed in outlays on fixed assets in outlays on innovations in general. In 2008, the structure index in industrial enterprises was almost 85%, whereas in 2012, this level was slightly over 70%. Another (in terms of the level of outlays) type of innovative activities was outlays on research and development. An increasing tendency can be observed for contribution of these outlays in general in the amount of outlays on innovations. This value increased from 8% in 2008 to nearly 17% in 2012. Other outlays on innovative activity i.e. purchase of knowledge from external sources, purchase of software, training of personnel connected with innovative activity or marketing concerning new and significantly improved products represent an insignificant percentage of the overall amount.

Table 4. Structure of outlays on innovative activities in enterprises from the sector of services in 2008 -2012 in Poland

	2008	2009	2010	2011	2012
<b>R&amp;D</b>	5.7%	9.1%	12.8%	13.1%	40.9%
<b>acquisition of external knowledge</b>	1.8%	7.7%	7.9%	-	-
<b>acquisition of software</b>	11.3%	15.3%	14.9%	14.4%	9.5%
<b>capital outlays on fixed assets</b>	74.8%	58.1%	55.7%	54.8%	32.1%

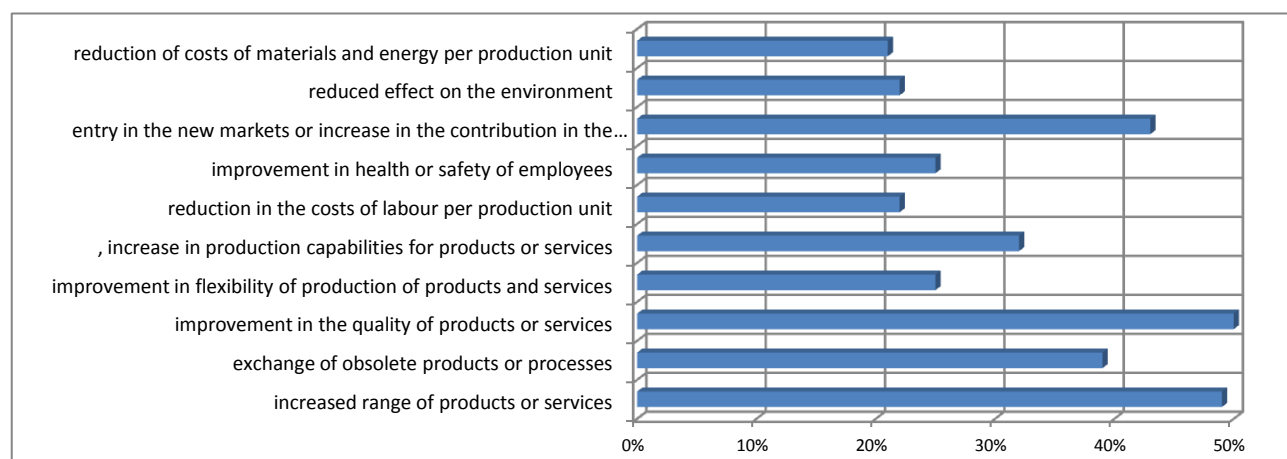
<b>staff training connected with innovation activity</b>	0.6%	0.7%	0.7%	-	-
<b>marketing for new and significantly improved products</b>	2.7%	6.3%	4.6%	4.5%	6.6%

Source: author's own elaboration based on: GUS. 2013b, pp.138-139.

In the enterprises from the sector of services, the structure of outlays on innovative activity differs significantly from the structure of these outlays concerning industrial enterprises. Nevertheless, the highest share in outlays on innovations is from investment outlays on fixed assets, but their value did not exceed the level of 80% of overall amount of outlays. A declining tendency was also observed in this case for the measure analysed from nearly 75% in 2008 to 32% in 2012. Furthermore, a substantial increase in outlays on research and development was also found. In 2008, these outlays accounted for 6% of overall outlays on innovations, whereas in 2012, this number rose to 2012. Among other types of outlays on innovations, the most essential importance in general structure was from the outlays on purchase of software. Their value over the period studied was similar (at the level of ca. 15%). Furthermore, the level of outlays in the enterprises studied spent on training employees connected with innovative activities was relatively small compared to overall amount of expenses on innovations.

Furthermore, the goals that drive innovative activities in the enterprises studied were verified. The following motivations were found in implementation of innovations: reduction of costs of materials and energy per production unit, reduced effect on the environment, entry in the new markets or increase in the contribution in the market, improvement in health or safety of employees, reduction in the costs of labour per production unit, increase in production capabilities for products or services, exchange of obsolete products or processes, increased range of products or services. The chart below presents the percentage of entities that emphasized the significance of the specific aim.

Diagram 3. The aims of the innovative activity of enterprises among innovative enterprises in terms of products or services



Source: author's own elaboration based on: PARP, 2013, pp. 136 and 137

Empirical studies also analysed the aim of innovative activities of enterprises. The results obtained in the study indicate that the enterprises carry out innovative activities

in order to increase the range of products or services (nearly 50% of the respondents), improve quality of goods or services (nearly 50% of the respondents) and entry into new markets or increase share in the market (over 40% of the respondents). The study did not find the increase in revenues on sales as the direct aim of innovative activities in enterprises.

## **5. PROBLEMS OF THE AIM OF ENTERPRISE'S ACTIVITY IN THE CONTEXT OF INNOVATIVE ACTIVITIES**

There are a variety of approaches to the problems of the aim of enterprise's activity in the literature. Theory of economy and management and economic practice show that determination of the leading aim of operation of the business entity represents a difficult and complex problem. These problems can be considered in the context of various objectives of financial, managerial and social character. One of the key issues concerning an enterprise is to determine the direction for the entity to follow as well as ways to achieve this goal.

There is a view in scientific publications that points to various aims the entity is guided by during its creation and operation. A. Noga (2009) suggests that these aims include e.g. generation of profit, creating the company value, creation of value added, maintaining financial liquidity, performing managerial tasks that are connected with the level of sales or activities connected with self-realization, prestige, success and creation of new job opportunities.

Therefore, the enterprise's aims should be viewed from various standpoints. E. Grzegorzewska-Ramocka (2009) points to the following properties that determine aspirations of the enterprise: temporal horizon (short-term, medium-term, long-term), way of vocalization of the aims (apparent and real), freedom of formation (which is of objective and subjective character), interference of aims (consistent or conflicting), the form of appearance (striving for maximization or minimization or satisfactory). Furthermore, L. Komorowski (2011) differentiated between the three principal dimensions of the enterprise's aims. They are collected around the directions with personal, physical and financial character. In the first case, they relate to human capital and determined the perspective of internal development of a specific organization and achievement of individual aspirations of employees in the context of conditions of work, experiences, skills, professional satisfaction and self-realization. In the second context, they concern strengthening of production potential, modernization of organization and product development. Therefore, they are connected directly with innovative activities carried out in the enterprise. Using the last approach, they are connected with the process of enterprise development in terms of increase in its value. While focusing on the financial aspect, it should be emphasized that the commonly adopted strategic, long-term objective of the enterprise is maximization of its value (see e.g. Wildemann 2007, Palli 2004). This was based on assumptions formulated by A. Rappaport (1986) in the eighties of the 20<sup>th</sup> century, maximum profitability for its shareholders (*Shareholder Value*). A dynamic development of capital market, their liberalization, openness of economies and expansion of private capital as well as dynamic development of the sector of new technologies contributed to adoption of maximization of enterprise value as an overriding aim of enterprise operation.

Contemporary approach presented in the science of management of enterprises assumes that maximization of enterprise's value can be understood as the increase and maximization of benefits to owners. J. Duraj (2000) finds that achievement of this aim depends on the decisions which mainly concern dimensions and ways of financing the property, formation and division of profit, level and directions of investments. According to M. Marcinkowska (2000), it can be regarded that

considering maximization of the value as the aim of enterprise's operation focuses the optics of all the enterprise's activities on achievement of this aim.

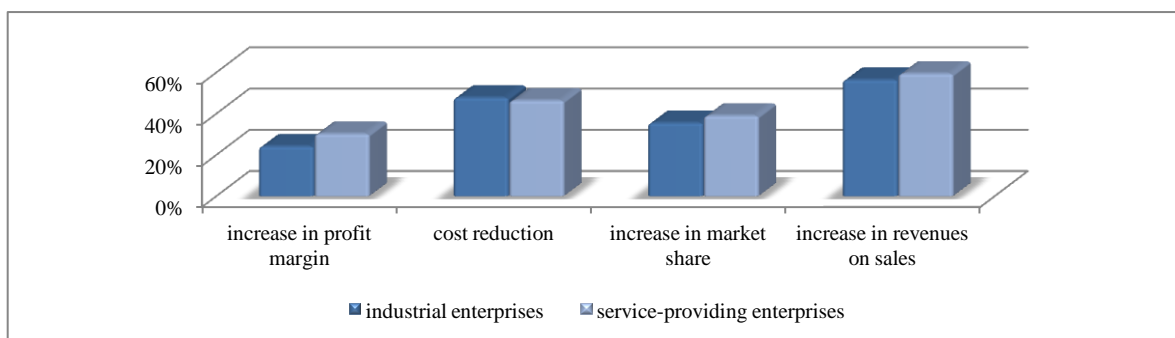
The resources in the enterprise, processes performed and the interactions between each other are in this case considered in terms of effectiveness and creating value. Higher level of value is viewed as higher return on the capital invested. Furthermore, increasing the value of a specific entity contributes to its development and efficient functioning. Through multiplication of its value, the enterprises are able to keep previous customers and compete for new markets. Therefore, the increase in the value of a specific entity implies the increase in the value of the whole supply chain, whereas the strategic aim of the activity of a specific entity translates into the aim of activity of the whole supply chain in the form of the increase in value of all its stakeholders.

With regard to the significance of the concept of creating value, which results mainly from its essence of a strategic tool for management of enterprises and connecting the area of interest of all stakeholders of the enterprise, one should emphasize the behavioural approach in the concept of achievement of the aim of the enterprise's activity. T. Galewski (2013) stressed the present dominant importance of this standpoint which assumes that any enterprise, which is characterized by certain specific properties that affect achievement of the goals. Therefore, the criterion of the aim of enterprise's activity should be adjusted to the concrete case (concrete entity). The authors cited writes that the enterprise is often unable to achieve certain aims (and even define them) since the tasks which should be realized are not within its capabilities. Therefore, the assumed aim of enterprise's activity should be adequate for the potential used by the specific entity. Thus, an immanent dependency of the aim of an enterprise and the method of achievement of this aim on the result of the decision-making process in the enterprise can be indicated.

It should be emphasized that the enterprises might adopt multiple aims of activity which can often be contradictory. Furthermore, the objectives of the enterprise can change at various stages of its operation. In the initial period of activity, the primary focus of the business entity is on achievement of a specific level of sales or winning the competitive position. At further stages of operation, the principal aim can be generation of the assumed level of profit or generation of the value added. Nevertheless, during achievement of each aim, it is essential to determine not only directions and tools to achieve the aim but also to determine the methods to motivate for realization of the specific aim.

The empirical studies analysed the significance of such aims as increase in market share, increase in revenues on sales, cost reduction, increase in profits.

Diagram 4. Enterprises which evaluated the importance of the aim of activity as "high" in 2010-2012

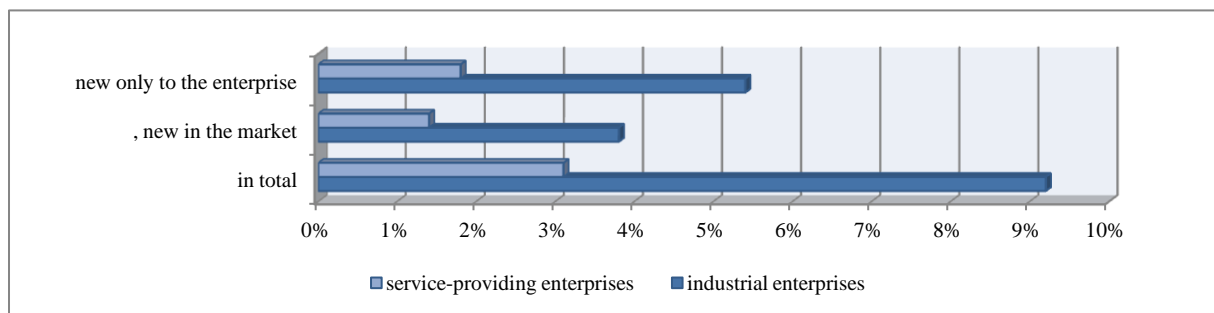


Source: author's own elaboration based on: GUS, 2013a, pp. 112 and 113.

According to the respondents, the primary aim of activity is increase in revenues on sales. This view was expressed by over 50% of industrial and service-providing enterprises. Furthermore, an important objective of the entities studied is reduction in costs of activity. For nearly 40% enterprises, the activities should be oriented at this aim. Another important factor is increase in the market share, thus improvement in the competitive position. Over 35% of enterprises evaluated the importance of this aim as "high". Among the above important objectives the enterprises are driven by, the last place was taken by the increase in the margin. The priority of this aim was declared by 24% of industrial enterprises and 30% of service providers.

It can be concluded based on the analysis of the above data that the increase in incomes on sales is of essential importance to enterprises studied. Diagram 5 presents the results of the survey concerning the share of revenues on sales of new or significantly improved products in revenues on sales in total.

Diagram 5. Share of revenues on sales of new or significantly improved products in revenues on sales in total in 2012 (innovations implemented in 2010-2012)

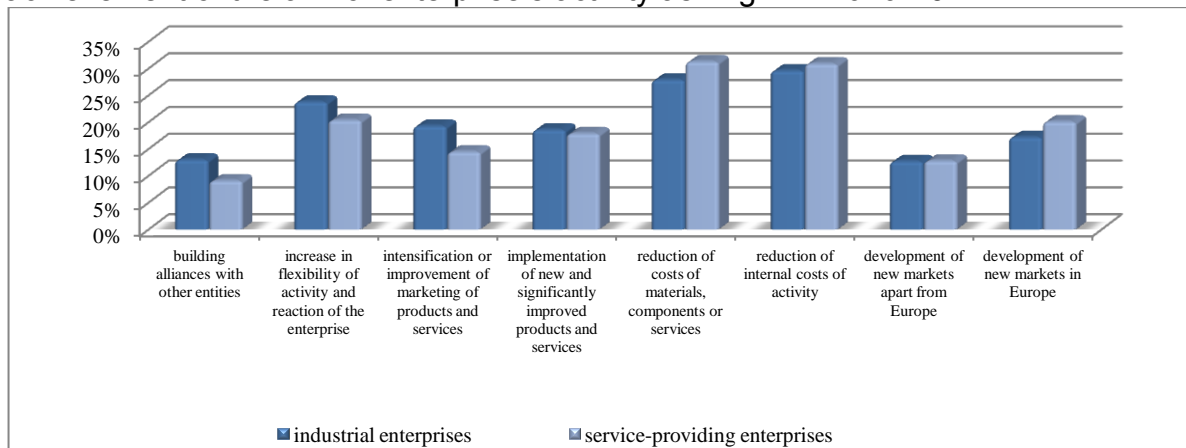


Source: author's own elaboration based on: GUS, 2013a, pp. 61, 63, 65, 66

Analysis of the share of revenues on sales of new or significantly improved products in revenues on sales in total shows that this relation in industrial enterprises is at the level of 9%, with 3% observed in service-providing enterprises. Slightly higher share in revenues on sales in total is obtained on sales of products that are new for the market rather than for the enterprise.

The next step was to analyse the data that relate to the importance of the strategy of operation adopted in the enterprise for achievement of the aim adopted by the enterprise. The percentage value presented in Diagram 6 reflects the percentage of the entities studied which consider adoption of a specific strategy as highly significant for achievement of the aim of activity. The strategies mentioned were: building alliances with other entities, increase in flexibility of activity and reaction of the enterprise, intensification or improvement of marketing of products and services, implementation of new and significantly improved products and services, reduction of costs of materials, components or services, reduction of internal costs of activity, development of new markets apart from Europe, development of new markets in Europe.

Diagram. 6. Enterprises which evaluated the importance of a specific strategy for achievement of the aim of enterprise's activity as "high" in 2010-2012



Source: author's own elaboration based on: GUS, 2013a, pp. 116 and 117.

Based on the analysis of importance of a specific strategy for achievement of the aim of activity, one can indicate that the most essential factor in achievement of the assumed aim is cost reduction (in various areas of activity). Further, according to nearly 20% of respondents, high importance in achievement of the assumed aim of activity is from implementation of new or significantly improved products or services. Therefore, it should be indicated that in general terms, the enterprises surveyed do not associate innovative activities with opportunities for achievement of the aim of enterprise activity of the increase in revenues on sales.

#### 4. METHODOLOGY OF VERIFICATION OF RESEARCH HYPOTHESIS

Previous analysis demonstrated that the increase in revenues on sales was found by the enterprises studied as one of the most essential aims of the enterprise's activity. Furthermore, it can be observed that the share of revenues on sales of new or significantly improved products in revenues on sales in total was in the industrial enterprises at the level of ca. 10%. However, the entities surveyed did not point to innovative activities as a direct strategy of achievement of the aim of enterprise's activity. The above conclusions allowed for proposing the research hypothesis which says that the increase in enterprises' innovativeness leads to the increase in the revenues on sales. Empirical verification of the hypothesis was carried out based on the data contained in statistical yearbooks of the Central Statistical Office of Poland for the years 2005-2012.

In order to examine the relationships between the percentage of enterprises which implemented innovations in 2010-2012 and the revenues on the wholeness of activities of industrial enterprises in 2005-2012, a logit model was used, which is an econometric model of binary variables. It describes formation of random endogenous variables that adopt the values of either zero or one and has a form of (see e.g. Kufel. 2011):

$$y_i^* = \ln \frac{P_i}{1 - P_i} = \beta_0 + \sum_{j=1}^k \beta_j x_{ij} + u_i$$

where:  $y_i^*$  - logit

$P_i$  – probability of the dependent variable  $y_t$ , determined based on the logistic distribution from the equation:

$$\frac{P_i}{1 - P_i} = e^{y_i^*} = e^{\beta_0 + \sum_{j=1}^k \beta_j x_{ij} + u_i}$$

$$\hat{P}_i = \frac{P_i}{1 + e^{-y_i^*}} = \frac{1}{1 + e^{-(\beta_0 + \sum_{j=1}^k \beta_j x_{ij} + u_i)}}$$

The essential fact in the logit model is the marginal effect at the means, which represents the evaluation of the first derivative for the mean and means direction (inclination) of the change of probability of the specific variable. The evaluated marginal effects indicate that:

- the increase in a value of a variable increases the probability of obtaining the value 1 for the dependent variable if the marginal effect is positive,
- decrease in a value of a variable increases the probability of obtaining the value 1 for the dependent variable if the marginal effect is negative,

The significance of the factors adopted in the model as explanatory variables were examined based on the Student t-test. Model verification was also based on:

- number of properly predicted cases i.e. estimated *computational value*  $R^2$ , which helped globally estimate the degree of matching the model to the data based on the sample used for construction of the model; in other words it represents the number of cases for which the model properly determined the predicted value,
- *McFadden's pseudo R-squared*, which is the measure of  $R^2$  type (although it does not have an counterpart in any  $R^2$  defined for the linear regression model),
- likelihood ratio test i.e. test of significance of the estimated equation (if  $p$  is lower than the assumed significance level, the significance of the whole regression occurs),
- correlation coefficient, which is determined as correlation of the variable  $y_i$  with theoretical values of the model  $\hat{P}_i$ , i.e.  $R = r(y_i, \hat{P}_i)$ .

Furthermore, Yule's coefficient of association was used in order to measure the level of relationships between binary variables, which in this case is identical with correlation coefficient. This measure was calculated based on the following formula:

$$\rho(X;Y) = \frac{ad - bc}{\sqrt{(a+b)(a+c)(b+d)(c+d)}},$$

Based on frequencies of pair occurrence determined from cross table: 1–1 (a); 1–0 (b); 0–1 (c); 0–0 (d).

Analysis concerned the data that characterize innovative activities in enterprises grouped according to the type of activities defined as in the Polish Classification of Activities (GUS. 2013c). The statistical sample was 28 sections of PKD:

1. manufacture of coke and refined petroleum products,
2. mining of coal and lignite,
3. manufacture of pharmaceutical products,
4. manufacture of computer, electronic and optical products,
5. manufacture of chemicals and chemical products,
6. manufacture of motor vehicles, trailers and semi-trailers,
7. manufacture of electrical equipment,

8. manufacture of machinery and equipment,
9. manufacture of tobacco products,
10. manufacture of other transport equipment,
11. electricity, gas, steam and air conditioning supply,
12. manufacture of beverages,
13. manufacture of basic metals,
14. manufacture of rubber and plastic products,
15. other manufacturing,
16. manufacture of other non-metallic mineral products,
17. manufacture of paper and paper products,
18. manufacture of furniture,
19. water collection, treatment and supply,
20. printing and reproduction of recorded media,
21. manufacture of metal products,
22. manufacture of textiles,
23. repair and installation of machinery and equipment,
24. manufacture of food products,
25. waste collection, treatment and disposal activities; materials recovery,
26. manufacture of leather and related products,
27. manufacture of products of wood, cork, straw and wicker,
28. manufacture of wearing apparel.

The relationship between the percentage of enterprises which implemented innovations in 2010-2012 and revenues on the total activity of industrial enterprises in 2005-2012 was examined. A logit model that describes the likelihood of the increase in enterprises' innovativeness grouped in PKD sections was also construed in order to investigate the relationship. The increase in innovativeness was understood to mean a percentage of innovative enterprises in a specific section. The measures were defined as follows:

1. the explanatory variable was the percentage of innovative enterprises grouped in PKD sections, determined as binary variable, with the value 1 meaning the percentage of enterprises which implemented in 2010-2012 new or significantly improved products higher than the second quartile and value 0 meaning the percentage of these enterprises not higher than the second quartile
2. the explanatory variable was average annual increase in revenues on the wholeness of activity of industrial enterprises in 2005-2012 in individual PKD sections.

The model was built for spatial data, whereas a PKD section was adopted as a unit.

## **7. RESULTS OF THE MODEL ESTIMATION AND VERIFICATION MODEL AND ANALYSIS OF CORRELATIONS**

Results of model estimation and verification were presented in Table 1.



Table 5. Results of logit model estimation and verification

Model for variable: <i>percentage of enterprises which implemented new or significantly improved products in 2010-2012</i>												
Variable	Coefficient	Standard error	Statistics <i>t</i>	Marginal effect at the mean								
const	-18.8019	11.3192	-1.661									
<i>Average annual increase in revenues on the wholeness of activity of industrial enterprises in 2005-2012</i>	17.4662	10.5083	1.662	4.36655								
Arithmetic mean for dependent variable 0.500000 Standard deviation of dependent variable 0.250000 McFadden's R-squared 0.090531 Corrected R-squared -0.012519 Likelihood logarithm -17.65109 Akaike information criterion 39.30217 Bayes-Schwartz criterion 41.96658 Hannan-Quinn criterion 40.11671 Number of correctly predicted cases 17 (60.7%) f(beta'x) at mean of independent variables 0.250 Likelihood ratio test: Chi-squared (1) 3.51407 [0.0608]												
<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Prediction</th> </tr> <tr> <th>0</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>Empirical</td> <td>0 8 6</td> </tr> <tr> <td></td> <td>1 5 9</td> </tr> </tbody> </table>					Prediction		0	1	Empirical	0 8 6		1 5 9
Prediction												
0	1											
Empirical	0 8 6											
	1 5 9											

Source: author's own calculations using GRETl software

Positive sign of the parameter at the explanatory variable indicates that *average annual increase in revenues on the wholeness of activities of industrial enterprises in 2005-2012* is conducive to "being innovative". Higher average annual increase in the revenues on the wholeness of activities demonstrated in 2010-2012 in the enterprises grouped in PKD sections corresponded to greater likelihood of a percentage of innovative enterprises in a section which is higher than the second quartile. Therefore, high annual increase in revenues on the wholeness of activity of enterprises in a section causes the increase in the likelihood that the section is characterized by the percentage of enterprises which implemented new or significantly improved products that guarantee the place among the most innovative sections. This happens because the higher percentage of innovative enterprises in a section, the higher level of innovativeness. Test of significance of the equation points to the significance of the whole regression at the level of significance lower than 0.1 ( $p = 0.0608 < 0.1$ ).

The marginal effect at the mean represents evaluation of the first derivative for the mean and means direction (inclination) of the change of likelihood for the specific variable. Consistency of signs of the evaluated marginal effect with the sign of parameters supports the interpretation of the relationship.

The number of properly predicted cases means the number of cases for which the model properly determined the predicted value. However, this value is not high and amounts to 60.7%. Therefore, it can be concluded that matching the model to the data based on the sample is medium high.

Furthermore, correlations were found between two binary variables (at the level of significance 0.01):

1. percentage of innovative enterprises in terms of products, with the value 1 meaning percentage of enterprises which implemented new or significantly improved products in 2010-2012 higher than the second quartile and value 0 meaning the percentage of these enterprises not higher than the second quartile;
2. percentage of innovative enterprises in terms of processes, with the value 1 meaning percentage of enterprises which implemented new or significantly improved processes in 2010-2012 higher than the second quartile and value 0 meaning the percentage of these enterprises not higher than the second quartile;

This relationship was measured using Yule's coefficient of association, which in the case of binary variables is identical with correlation coefficient. For the variables separated, Yule's coefficient was 0.57, which represents mean positive correlation between the percentage of innovative enterprises in terms of products and percentage of innovative enterprises in terms of processes. The significance of the relationship analysed was also demonstrated with the chi-squared independence test and the hypothesis of independence of the two characteristics at the level of significance 0.01 was rejected. Therefore, it can be adopted that the value of Yule's coefficient is significantly different from zero. Therefore, the conclusion can be formulated that the increase in the percentage of enterprises in the sections which implemented new or significantly improved products in 2010-2012 is associated, at the average level, with the increase in the percentage of enterprises in the sections which implemented new or significantly improved processes in 2010-2012. This leads to the conclusion that the enterprises usually implement parallel product and process innovations.

Furthermore, a correlation was also calculated based on the Pearson's linear correlation coefficient. The table below presents the type of verified correlations and Pearson's linear coefficients obtained during calculations.

Table 6. Pearson's linear correlations coefficients for the correlations studied

Type of correlations	Pearson's linear correlation coefficient
1. Change in revenues on the wholeness of activity of industrial enterprises in 2012 compared to 2011 (calculated in absolute terms) and outlays on innovative activity in 2012	-0.0416
2. Change in revenues on the wholeness of activity of industrial enterprises in 2012 compared to 2011 (calculated in absolute terms) and percentage of innovative enterprises in 2010-2012	0.054037
3. Change in revenues on the wholeness of activity of industrial enterprises in 2012 compared to 2011 (calculated in absolute terms) and percentage of innovative enterprises in 2010-2012	0.074563
<b>4. Change in revenues on the wholeness of activity of industrial enterprises in 2012 compared to 2011 (calculated in absolute terms) and percentage of enterprises which implemented process innovations in 2010-2012</b>	<b>0.380134*</b>
5. Change in revenues on the wholeness of activity of industrial enterprises in 2012 compared to 2011 (calculated in	0.208038

absolute terms) and percentage of enterprises which implemented product innovations in 2010-2012	
6. Annual rate of changes in the revenues on the wholeness of activity of industrial enterprises in 2005-2012 and outlays on innovative activity in 2012	0.125746
7. Annual rate of changes in the revenues on the wholeness of activity of industrial enterprises in 2005-2012 and percentage of enterprises which implemented process innovations in 2010-2012	0.279765
8. Annual rate of changes in the revenues on the wholeness of activity of industrial enterprises in 2005-2012 and percentage of enterprises which implemented product innovations in 2010-2012	0.166444
9. Outlays on innovative activity in 2012 and percentage of enterprises which implemented process innovations in 2010-2012	0.19506
10. Outlays on innovative activity in 2012 and percentage of enterprises which implemented product innovations in 2010-2012	-0.01114

\*coefficient which is statistically significant at the level of 0.05

Low values of Pearson's linear correlation coefficients reflect a poor or lack of linear correlation between the variables. In order to evaluate the significance of the linear correlation coefficients, the hypothesis that the characteristics are uncorrelated in general population was verified. Student's t-test was used due to a low size of the sample for verification of the hypothesis. The critical value of the statistics (2.055529) was evaluated for the significance level of 0.05. Therefore, only a moderate level of relationships between the increase in revenues on the wholeness of activity of industrial enterprises and percentage of enterprises which implemented process innovations in 2010-2012 was observed in 2012 compared to 2011 (expressed in absolute terms). However, in the enterprises in total (regardless of the size), no significant relationship was found between the increase in revenues on the wholeness of activity of industrial enterprises in 2012 compared to 2011 (expressed in absolute terms) and other variables.

## 6. Conclusion

Finding no statistical correlations between the variables studied does not reject the hypothesis of positive effect of innovative initiatives on the revenues on the wholeness of activities. The lack of statistically significant correlations can be caused by:

- definition/explanation of the level of innovativeness of enterprises in individual PKD sections with the percentage of innovative enterprises,
- presence of the lagged relationship between the variables studied,
- lack of direct effect of variables on each other,
- periods adopted for analysis.

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