PROCESS INNOVATIONS AND MARKET SUCCESS
IN ENTERPRISES – RESULTS OF EMPIRICAL RESEARCH

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Introduction/background: Achieving competitive dominance is a challenge for every company operating on the market and for management team throughout the whole world. In order to achieve distinctive competence, the companies are forced to look for such unique solutions that would enable to achieve dominance and that are not available for other business entities. The study presents the results of empirical research verifying the relationship between innovation and market success of enterprises in the metal industry. By analyzing the determinants of innovation and market success, the existence of a significant relationship between the variables was confirmed.

Aim of the paper: The author of this paper conducted empirical research and analyzed their results in the area of innovation in order to identify the relationship between the success of metal industry enterprises and market success.

Materials and methods: The research covers the study of the innovativeness of enterprises and the analysis of the success rates of enterprises in the metal industry. The research was carried out using the CAWI (Computer Assisted Web Interview) method in the form of a questionnaire to be completed on a computer by the respondent and a paper questionnaire also for self-completion.

Results and conclusions: The research outcome was to indicate the relationship between the determinants of the company's success and their innovative activity, and to identify the strength of the impact between the variables.

Keywords: innovation, metal industry, market success, company improvements.

1. Introduction

In colloquial terms, innovation means something new and different from existing solutions; is equated with the need to change for the better and is very often used as a synonym for the word change (Janasz, and Kozioł, 2007). It is most often perceived as changes in the technical scope, created by economic entities conducting research and development activities, as a result

of which inventions are created, which are most often new from the point of view of the consumer after being placed on the market (Kalinowski, 2010).

Today, the concept of innovation is seen in a broader sense. Innovations are equated with systematically implemented activities aimed at increasing the efficiency of the company, relating to the use of new processes, technologies, materials, as well as creating new business visions and complex strategies. Implementing innovations means not only introducing revolutionary changes in the manufactured product. The scope of implemented changes equated with innovations is much wider (Kraśnicka, and Ingram, 2014).

In the economic interpretation of innovation, it is assumed that it is related to knowledge and available technology, and causes changes in the production and demand functions (Borko, 2013). Innovative activity is a sequence of activities leading to the creation of new or improved products, technological processes or organizational systems. The precursor of the concept of innovation in economic sciences is considered to be J.A. Schumpeter, who in 1911 concentrated his scientific activities on an attempt to dynamize the static model of the market economy. He pointed out that the main cause of economic development are not exogenous but endogenous factors, which are innovations (Zastempowski, 2016). The key meaning in its concept is the word "new", identified in the sense of introducing a given factor for the first time, using it in practice and obtaining a positive economic result (Borko, 2013).

Schumpeter's considerations are considered a starting point for the present broad understanding of innovation and for establishing methodological assumptions in innovation research (Kamińska, 2017). In his studies, he also separated the meaning of the term "innovation" from "invention", noting that only the invention that is introduced into production and enables the achievement of a positive economic result becomes an innovation. To a large extent, Schumpeter's scientific activity focused on technical innovations and their importance for the economy, however, the theories created also indicated non-technological factors that could occur in the area of trade or transport. His first theory of innovation concerned the capitalist economy of the early 20th century, in which land, labor and capital played a fundamental rule (Borko, 2013).. Other factors were noticed by the scientist and indicated in the analyzed definition of innovation, however, they did not constitute the basis for his considerations.

Positive economic result is interpreted heterogeneously, it depends on the type of business activity and the entity's policy. There are also non-profit organizations for which development is not equated with the economic dimension of their activities. Therefore, it is advisable to use a uniform nomenclature for the measure of implementing the policy of an economic entity. In the literature, the terminology used indicates that the universal measure of the assessment of implemented activities is the measurement of the success achieved by the organization. Success is the successful outcome of an undertaking, achieving an intended goal. In personal terms, success means fulfillment in life, the source of which is a sense of meaning in work and personal life (Weitley, 2011). In terms of the market, the definition should be related to the goals the

achievement of which enables the development of the enterprise and effective competition on the open market. Due to the different nature of the business and target customers, success cannot be clearly defined. It is a subjective category, for each enterprise, it is an individual feature (Kozielski, and Mardosz, and Matuszewska, 2017). For some, success may mean staying on the market, stagnating, while for others, achieving the assumed goals in the form of increasing profitability, profits, turnover, etc. The moment of achieving success is also perceived differently. On the one hand, it may be determined by achieving the goal, and on the other hand, by keeping the organization on the market. Success is therefore a category that is difficult to define precisely.

J. Żurek adds that the company's success also means creating conditions inside the company, which will positively influence the development of rules facilitating the flow of information, building healthy relationships that mobilize for cooperation and integrating its staff into a friendly atmosphere at work, dominated by trust and openness (Żurek, 2016).

M. Grabowska and M. Drygas identifying the determinants of the success of enterprises defined a successful enterprise as a company that generates profits and has been operating on the market for at least several years, systematically developing by increasing revenues and strengthening its market position. The authors also emphasize that the company's success may be perceived differently, for example, by their employees, who identify it through a high level of remuneration, job security, as well as high quality of life. The real success of an organization, however, consists of successes in many areas, including in the area of the achieved position in a given sector or achieving a competitive advantage ensuring profits and development in the coming years (Grabowska, and Drygas, 2010).

Literature analysis allowed to identify the existence of links between innovation and the competitiveness of Polish enterprises in the global economy (Janas, 2019). The analysis of the literature by A. Litińska allowed for the identification of positive relationships between innovation, entrepreneurship and organizational results, either in financial or strategic terms in the fashion industry, considered one of the most innovative areas of the economy (Litińska, 2020). On the basis of the collected data, there are no similar studies in the area of metal industry enterprises. It was decided to verify the impact of innovation on the results of enterprises in this area to confirm the essence of this relationship in the process of competing on the global market.

2. Methods of empirical research

When analyzing the definitions of success and innovation, it is impossible to notice the universal nature of both terms. Their topicality applies to all activities and entities. However, research in the literature did not allow to identify the relationship between the two variables in the realities of a free market economy. The empirical study was carried out in 2019 among

enterprises in the metal industry employing at least 10 employees. The size of the surveyed enterprises is in line with the international innovation research methodology set out in the Oslo Manual. The research was carried out using the CAWI (Computer Assisted Web Interview) method in the form of a questionnaire to be completed on a computer by the respondent and a paper questionnaire also for self-completion.

Based on data from the Central Statistical Office of Poland from 2018, the entire population was estimated at the level of 69,053 enterprises in the metal industry in Poland. The minimum sample size for such a population for alpha = 0.95 and the maximum error of 5% was 382 entities. Initially 384 companies took part in the survey. 76 business entities took an active part from the survey population, filling in the questionnaire, which constitutes 16.88% of the research sample. Only enterprises employing more than 10 employees were chosen for further research. Finally, responses from 53 companies from the metal industry were analyzed, which is 11.77% of the initially estimated research sample. With such a research sample size for the confidence level of α = 0.95, the obtained results may differ from the actual value of the population by no more than 14% (maximum error).

In the conducted study, a research tool in the form of a questionnaire was used. The questionnaire contained a certificate allowing to identify the size of the examined economic entity and to define the province in which the examined entity conducted its business activity. The respondents were employees of metal industry enterprises. The research sample of enterprises comprised 50.9% of the surveyed entities from medium-sized enterprises. Both large and small enterprises had a 24.5% share each in the entire research population.

The aim of the empirical research was to examine whether there are significant relationship between the dependent variables in the area of innovation and business performance are considered indicators of success. The research survey made it possible to verify the dependence of the dynamics of outlays on innovative activities and the development of metal industry enterprises and the impact of implemented innovations on the long-term development of the company as well as the improvement of its competitive position. Cramer's V correlation analysis for nominal variables, Spearman's rho correlation for ordinal variables and Phi correlation for two-dimensional variables were used to study the significance as well as the strength and direction between the variables.

3. The role of process innovations in shaping the success of enterprises

The results obtained in the empirical study are presented in Table 1. The long-term development of enterprises as a result of introducing process innovations as a variable subject to verification showed a significant correlation with the four dependent variables. Spearman's rho correlation coefficient = -0.394 for the variable "impact of the availability of innovative

solutions on the achieved innovation"; showed a negative moderate relationship between the company's long-term development and the benefits of product innovation. Along with the development of the enterprise and the strengthening of the competitive position, the significant impact of product innovations on the company's results decreases.

Table 1.
The significance of the correlation between the long-term development of the studied enterprises and effective competition on the markets and other dependent variables

Variable X	Variable Y	Correlation rho-Spearmana	Relevance
Achieving long-term development as a result of introducing innovations	The impact of product innovations on the company's results	-0,394	0,004
	The impact of technological innovations on the company's results	-0,396	0,003
	Variable Y	**Correlation V Cramera**	**Relevance**
	Availability of innovative process solutions	0,340	0,016

Adapted from: own study based on empirical research.

A similar relationship was identified for the variable "The impact of technological innovations on the company's results". Spearman's rho-correlation coefficient = -0.396 indicates a negative moderate relationship between the long-term development of the company and the benefits of technological innovation. Along with the development of the enterprise and strengthening of the competitive position, the significant impact of technological innovations on the company's results decreases.

These dependencies indicate that each successive success, development of the company, increase in turnover, profit in absolute terms depends on many factors each time. Innovation, regardless of the size of the enterprise, has a positive effect on the chances of achieving the desired result of the conducted activity, it is an inseparable element of development. The results emphasize that the implemented innovations are not the only way to success, they should be perceived as one of the tools used to create and control the development of an enterprise.

In the results of empirical research, attention should also be paid to the obtained value of the Cramer's V correlation = 0.340 between the variables achieving long-term development as a result of introducing innovations and the availability of innovative solutions in the area of processes. The identified relationship proves a moderate relationship between the long-term development of the company and the assessment of the availability of innovative solutions. Therefore, the availability of innovative solutions in the process area does not constitute a barrier for developing enterprises. Along with the growth, these entities also have greater access to knowledge, which favors the creation of new innovative solutions.

The conducted empirical research was also focused on the identification of variables influencing the increase in turnover of the examined entities. The collected data made it possible to carry out a statistical analysis and to determine the correlation between the variables. The obtained statistical data allowed to distinguish four statistically significant variables

influencing the increase in turnover: dynamics of expenditure on innovation, achievement of long-term development as a result of the introduction of process innovation, the impact of technological innovations on the company's results and the dynamics of own funds allocated to innovation. Spearman's rho correlation = 0.310 indicated a positive moderate relationship between the increase in the company's turnover and expenditure on innovation. This means that the higher the turnover of the enterprise, the greater the expenditure on innovative activities. There was also a positive moderate relationship between the increased turnover of the enterprise and the long-term development of the enterprise. This is evidenced by the Spearman's rho correlation coefficient = 0.308. A statistically significant relationship with a moderately positive relationship was also identified for the variables increasing the company's turnover and the level of own funds allocated to innovation. The Spearman rho correlation = 0.413 indicates that along with the increase in the entity's turnover, the level of own funds for the implemented innovations is also increased. Therefore, it can be concluded that the financing of innovative activities in the examined group takes place both from external sources of financing and from own funds. Along with the development of enterprises, they increase outlays on innovation in general, which is influenced by the increase in the amount of own funds allocated for this purpose.

In the further part of the empirical research, the collected data was analyzed for predicting the value of the dependent variable based on a larger number of predictors. For this purpose, a regression analysis was performed. For the analysis of the influence of selected variables, a one-way logistic regression method was selected, consisting in the elimination in each subsequent step of the variable with the lowest impact on the dependent variable. The input model included the influence of all the examined independent variables, while the final model included only the influence of independent variables, or the model predictors, significantly affecting the dependent variable (expressed on a dichotomous scale).

Table 2.
Significance of the correlation between the turnover of the surveyed enterprises and other dependent variables

Variable X	Variable Y	Correlation rho-Spearmana	Relevance
The company increased its turnover	Dynamics of expenditure on innovation	0,310	0,024
	Achieving long-term development as a result of introducing process innovation	0,308	0,025
	The impact of technological innovations on the company's results	-0,303	0,027
	Dynamics of own resources allocated to innovation	0,413	0,002

Adapted from: own study based on empirical research.

The estimation of the independent variable "the company cooperates with research and development centers" and the dependent variable "The company has not lost any of its recipients in the last three years" was based on the model built. This model assumed that the entity's cooperation with research and development centers influenced the maintenance of cooperation with customers. In order to test whether the prediction was better than predicting only on the mean, the significance of the regression model was tested based on the analysis of variance between the study groups. The result of the analysis of variance is statistically significant $F_{(1.51)} = 3.939$; $p < 0.05$. This means that the regression model predicts the outcomes of the dependent variable better than the mean. The statistical significance of the model coefficients was also tested further. The predictor allows for the development of cooperation with clients. Therefore, it can be assumed that the entire model is relevant, which allowed for its further verification process.

Table 3.
Statistical significance of the coefficients of the model of dependence of the enterprise size and the impact of the availability of innovative solutions on the achieved innovation

Model	Non-standardized coefficients		Standardized coefficients	t	Relevance
	B	**Standard error**	**Beta**		
Constant	1,240	0,204		6,091	0,000
The company cooperates with research and development centers	0,260	0,131	0,268	1,985	0,043

Adapted from: own study based on empirical research.

Statistical significance of the coefficient $t = 1.985$; $p < 0.05$ means that there is a relationship between the company's cooperation with research and development centers and the fact that the company has not lost any of its recipients in the last three years. The Beta value $= 0.268$ shows that this relationship has a weak relationship and is positive, which means that companies that have established cooperation with external research and development entities are less likely to risk losing their customers.

The estimation for the independent variable "the enterprise cooperates with higher education" and the dependent variable "The introduction of innovations in the production processes of the enterprise allowed for long-term development and effective competition on the markets" was performed in a similar way. The constructed model assumed that the cooperation of the entity with higher education influences the innovation of manufacturing processes carried out in the enterprise. The result of the analysis of variance is statistically significant $F = 5.441$; $p < 0.05$. This means that the regression model predicts the outcomes of the dependent variable better than the mean. The statistical significance of the model coefficients was also tested further. The predictor allows to predict the achievement of long-term development and effective competition in the markets based on the increase in the innovation of production processes. Therefore, it can be assumed that the entire model is important, which allows for its further verification process.

Table 4.
Statistical significance of the coefficients of the model of dependence of the enterprise size and the impact of the availability of innovative solutions on the achieved innovation

Model	Non-standardized coefficients		Standardized coefficients	t	Relevance
	B	Standard error	Beta		
Constant	1,510	0,154		9,793	0,000
The company cooperates with higher education	0,234	0,100	0,310	2,333	0,024

Adapted from: own study based on empirical research.

Statistical significance of the coefficient $t = 2.333$; $p < 0.05$ means that there is a relationship between the cooperation of the enterprise and higher education and the introduction of innovations in the production processes of the enterprise, which allowed for long-term development and effective competition in the markets. The value of $ß = 0.310$ shows that this relation has a medium strength and is positive, which means that enterprises that cooperate with higher education have a better chance of increasing the innovation of their production processes.

4. Summary of empirical research

The investigated correlations between the variables allowed to identify numerous multiple connections between different pairs of dependent variables. The results showed that metal industry enterprises, in order to strengthen their market position, eagerly allocate their own resources to conducting innovative activities. As a result, the flexibility of their processes is better, which allows for a quick response to market information and improvement of the competitive position. At the same time, forced improvements in response to the portfolio of their clients mean that entities have a greater problem with strengthening their market position.

The obtained results of empirical research have shown that the achievement of long-term development and effective competition of entities on the markets by introducing innovations is determined by the need to improve processes as a result of cooperation with suppliers, monitoring the activities of competitors and the availability of innovative solutions. As a result of the decision to implement innovations, companies improve their competitive position, increase the supply and thus the turnover, some of which are transferred to further investments in new solutions. Increasing expenditure on innovation is in turn accompanied by an increase in the number of new customers.

The indicated relations between the variables confirmed the relationship between the conducted innovative activity and the achieved results of the metal industry enterprises, considered as determinants of market success. Metal industry enterprises allocating their own funds for innovation keep their existing customers and strengthen their market position. The increase in expenditure on innovative activities causes an increase in turnover. In addition,

innovative enterprises effectively compete, ensuring the development of the enterprise and increasing the production and sale of products. Therefore, it is essential to state that there is a need to implement innovative activities to create, use and implement long-term foundations for the growth of enterprises and achieve market success.

The results of empirical research and the analysis of the collected data confirm the positive impact of innovative activity on the development of metal industry enterprises and the factors that allow for achieving market success. Companies competing on the international market, wanting to maintain their current position or to disperse, are forced to constantly invest in new products. Innovations may be the result of conducting own research and development activities as well as cooperation with external entities.

As a result of data analysis, it is recommended to continue research in the area of using open innovations to obtain additional revenues and faster development of innovative projects.

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