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**OPEN INNOVATION AND THE PROPENSITY TO INNOVATE**  
**AMONG SME IN POLAND**

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***Abstract***

The propensity to innovate is defined in different ways. Innovation propensity is defined as a benefit for the company resulting from directly implemented innovations (e.g. an improved competitive position in the market). Another definition identifies it in terms of uncertainty (technical, financial, social, etc.), which is a determinant of decisions taken by entrepreneurs in the context of innovative development. Analyzing the interaction between the propensity for innovation and openness to the environment (open innovation), it is clear that they are in relation of complementarity to each other. However, it is difficult to determine in practice which of these two behaviors is primary and which is secondary. The aim of this paper is to analyze the propensity for innovation among SMEs in the context of open innovation, and answer the question if entities characterized by a greater degree of openness to the environment (open innovation) are more inclined to innovation or whether the tendency not directly depends on this factor. The research took place in 2017 among the selected (at the high level of innovation development) small and medium enterprises (SMEs) in the framework of the research project: The concept of "open innovation" in small and medium-sized enterprises – models, trends and determinants of development. The direct interview was the main source of information. The study included those entities which over the last three years conducted innovation activities in business areas.

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**Keywords:** Open innovation; propensity to innovate; small and medium-sized enterprises (SMEs).



## 1. Introduction

Innovation is an essential condition for the development of small and medium-sized enterprises (SMEs). However, as shown by recent studies, this condition is fulfilled only by approx. 20% of active business entities in Poland (European Union Scoreboard, 2012). This undoubtedly proves their relatively low propensity for knowledge transfer and commercialization in the environment. Generally, it must be assumed that this propensity determines the level of innovation of these companies. Its low level is determined by many factors, both of internal nature (mentality-related determinants resulting from a positive or negative attitude to the business environment on the part of entrepreneurs) and of external nature constituting a combination of the factors at the macroeconomic level (shaped by the state, such as legal provisions, access to financing, etc.), as well as at the microeconomic level (mostly shaped by the company itself) such as access to external resources or encouragement (from the environment) to conduct R&D activities. The paper focuses on internal determinants associated with companies' propensity to innovate in the context of their "openness" to the environment. It attempts to find an answer to the basic question whether and to what extent openness (open innovation) affects decisions made by entrepreneurs in terms of propensity to innovate. Thus, the adopted objective is to investigate the relationships between "open innovation" and the propensity to innovate manifested in specific benefits resulting from the implementation of innovations in the studied enterprises. The existence (or absence) of such relations will point to a large (or small) impact of OI on the formation of this propensity and, therefore, on the level of innovative development of the analyzed sector in the future.

## 2. Problem Statement

The propensity to innovate in the literature is defined in different ways. It can be described in terms of benefits derived by the company (financial, technical and technological, marketing and others) that allow it to gain a competitive advantage over other competitors in the market. A quite proportional correlation can be seen here consisting in a direct impact of benefits derived by the company on the thus generated propensity (the greater the benefits, the greater the propensity to implement innovations). Another approach to the conceptualization of this concept can be made in terms of propensity as a predisposition on the part of companies to create new technological and technical considerations. This predisposition, in turn, depends on: the level of inner knowledge, the ability to explore the environment in search for knowledge and the desire (or inclination) to technologically explore the environment (Nambisan, Agarwal, & Tanniru, 1999). Also, quite interesting (from the point of view of this paper) is defining this propensity as a state of uncertainty with respect to the enterprise's environment (as a result of past experiences) manifested in lack of trust (or only partial trust) visible in the style of leadership and communication with other entities (Ramseya, Ibbotsonb, & McCole, 2008). This lack of trust (uncertainty with regards to the environment) can be observed in several dimensions, among others, the financial, technical or organizational ones (Gerwin, 1988). It should be noted that in this case the correlation is inversely proportional: the smaller the degree of uncertainty as to the environment, the greater the propensity for implementing innovations. The above-presented definitions indicate that the propensity to innovate is a derivative of the degree of openness to the environment on the part of the enterprise (willingness to cooperate with other entities) and inclination to use it to improve its innovativeness

(Karasek, 2012). Analyzing the relationships between the propensity to innovate and openness to the environment (open innovation), it is clear that they remain in a relative complementarity with each other, assuming that this propensity is the “effect” of the OI concept used by the enterprise (and not on vice versa).

The concept of open innovation (OI) emerged as a new paradigm in the science of management only in 2003. The defining and describing of this phenomenon led to dualism in the management of innovation manifested in different attitudes of enterprises: a closed one (limited only to internal resources) and an open one (in which knowledge and other resources are not strictly assigned to one specific organization). Due to the creation of inter-organizational linkages, gradual blurring of the boundaries between businesses follows and free movement of knowledge (inflow and outflow) can be seen. Cooperative partnerships created through formal or less formal relationships (networks) are a manifestation of this phenomenon. The general rule is that the stronger these connections are, the easier it is to transfer external resources to enterprises and (in subsequent phases) to carry out their commercialization. Openness to the environment, therefore, means the inclination for cooperation (in terms of innovative development) with other entities (businesses, consumers, support institutions or research units). What determines the “strength” of relationships created with the environment? It seems that the answer to this question can only be one – tangible benefits that the parties (participants) derive from this cooperation. The most frequently mentioned benefits include: access to external resources, faster and easier access to new markets, reduction of costs and risks associated with implementing innovations (López, 2008), or maintaining the balance between two streams (inflow and outflow) (Schmidt, 2005), of which the latter (in the case of organizations conducting R&D activities) seems to be difficult to strictly control and maintain in the current environment (quick and easy flow of information) within the organization. It should be noted that the above-mentioned benefits (resulting from the application of the concept of OI) may also be related to the propensity of companies to innovate, becoming the common connecting element, emphasizing the close relationship between these elements (open innovation and the propensity for innovation). It is important, however, to determine which of the relationships from the point of view of OI are more important: vertical ones (suppliers, customers) or horizontal ones (universities, business support institutions, research units). According to research, SMEs far more appreciate relationships with suppliers and customers, contributing to the creation of innovative products, than contacts with external institutions (e.g. government bodies) (Zeng, Xie, & Tam, 2010). This view is also shared by Polish entrepreneurs who perceive vertical cooperation as the main source of knowledge contributing to their innovative development (Grzybowska, 2010; Olczyk, Starnawska, & Richter, 2011).

As shown by the “discoverer” of Chesbrough (2003), the concept is used as an instrument in gaining a competitive advantage by continually seeking external sources of innovation and possible applications (Chesbrough & Appleyard, 2007) of ready-made solutions which have not been previously used by other companies. The process of “constant search” results from the rapid “erosion” of internal innovative “achievements” due to high mobility of employees, which leads to the shortening of product life cycle (Ferro & Bonacelli, 2010). Almost to the end of the previous decade it was thought that the phenomenon of “permanent” search referred only to large organizations which sought in the environment

ideas and concepts that could be implemented. However, as shown by recent studies, the OI concept is also used among SMEs, although the motives of its use and effects of the phenomenon in this sector of enterprises have not been fully determined yet (Lameras, Hendrix, Lengyel, de Kreitas, & More, 2012).

### **3. Research Questions**

The above considerations have become the basis of formulating the following research questions:

3.1 Does the propensity to innovate among the “open” SMEs depend on their age and size?

3.2 Does the propensity of enterprises to innovate increase along with an increase in their size and age?

3.3 How does the level of uncertainty concerning potential benefits of cooperation with the environment impact on propensity to innovation?

3.4 Are SMEs cooperating with other enterprises in the environment (rather than with business environment institutions) characterized by greater propensity (strength) to innovation?

These questions allowed to determine the research hypotheses presented in the next paragraph of this article (point 4).

### **4. Purpose of the Study**

The intended purpose of this study is to investigate the relationship between two elements: openness to the environment (open innovation) and the propensity to innovate. It attempts to answer the previously posed question whether such a link exists and what strength of its impact is (the review of the literature included in the previous section suggests a positive answer, based primarily on examples of worldwide research). The propensity for innovation is measured here by benefits that the businesses derive from exploring the environment (collaboration with other entities and business institutions) in the search for new solutions (innovations) and implementing them in their companies. The strength of the existing correlation is measured by the assessment of the significance of these benefits for the companies' development made by the interested parties (the surveyed companies). The adoption of such an objective allows the formulation of the following main research hypothesis: The application of the OI concept (open innovation) determines a greater propensity to innovate. The following partial hypotheses are subordinated to this hypothesis: The propensity to innovate among “open” SMEs is dependent on their age and size – the propensity to innovate increases along with an increase in their size and age, while little (or no) propensity for innovation among closed businesses is determined by their high level of uncertainty concerning potential benefits resulting from cooperation with the environment, a greater propensity (strength) to innovation is demonstrated by SMEs cooperating with other enterprises in the environment than by the ones cooperating with business environment institutions.

### **5. Research Methods**

The results presented in this study provide an introduction to the general research on the concept of OI among SMEs financed by the Polish government for the years 2012-2018 within the framework of a research project. It was conducted on a small sample of subjects (103) at different levels of innovative development located in three voivodeships. In addition to the main sample, this study also encompassed

85 "closed" companies which were included for comparative assessment of available resources (and the propensity and the capacity for innovation) – hence the scope of the research was very limited. The method of direct telephone interview (CATI), carried out with competent people, i.e. people with the knowledge concerning implemented innovations, was used in this study. The main objective of the study was to assess the propensity of the enterprises to cooperate with other entities in the environment (companies, institutions supporting their innovative development, research institutes, as well as customers and suppliers) and to attempt to analyze the importance of this concept for the current and future development of entities in the studied sector. The study was based on several assumptions, among others, that the size of the companies in terms of number of employees could not exceed 249 (according to the EU classification) and covered only those manufacturing entities that implemented product and/or process innovations.

The study covered a relatively equal number of companies in each group: micro (36.8% open and 31.7% closed ones), small (34.9% and 34.1% respectively) and medium (28.1% and 34.1%). Such equal proportions are not maintained in relation to the location of the entities. Most of the surveyed companies had their headquarters in the region in which the seat of the entity implementing the project was (Łódź Voivodeship). The farther from the seat of the research unit, the smaller the number of analyzed entities (Łódź Voivodeship: 41% open and 37% closed ones, Mazowieckie: 34.4% and 35% respectively, Kujawsko – Pomorskie: 17.2% and 25.3% respectively). A positive aspect in the selection of this sample was the predominance of mature enterprises, i.e. with the market presence of more than 10 years – approx. 65% open and 30% closed entities. Growing companies constituted the remaining group (approx. 30% open and 35% closed entities respectively) and start – ups (approx. 5% for both groups). The predominance of mature entities allowed to obtain more reliable answers, i.e. consistent with reality.

## 6. Findings

The first of the adopted hypothesis assumes that the propensity to innovate among the “open” SMEs is dependent on their age and size – the propensity of enterprises to innovate increases along with an increase in their size and age. The verification of this hypothesis will be carried out in two stages. First, the “age” criterion will be taken into account, i.e. the length of the company's market presence (Table 01), then the criterion of “size” divided into groups (Table 01).

**Table 01.** Level of propensity to innovate of open enterprises by age (in %)

<b>Benefits (propensity to innovate) and enterprises ' age</b>	<b>Start-up enterprises</b>	<b>Growing enterprises</b>	<b>Mature enterprises</b>	<b>Total</b>
Benefits of cooperation with enterprises (N=55)	50.0	80.9	86.6	81.8
Benefits of cooperation with BEIs (N=33)	0	66.6	34.7	42.4

Note: Source: own elaboration

Analyzing the data presented in the table above, one can draw two main conclusions. Firstly, the entrepreneurs appreciate more contacts with companies in the environment than with business environment institutions. Secondly, this propensity increases with the age of the surveyed companies,

which allows to positively verify the first part of the adopted hypothesis. It is worth noting that benefits are relatively the most appreciated by the group of “growing” entities (operating from 3 to 10 years) which undoubtedly need new solutions (mainly technological ones) for their development, hence their high propensity to innovate. The data presented in Table 02 will be used to verify the other part of the hypothesis.

**Table 02.** Level of propensity to innovate of open enterprises by size (in %)

<b>Benefits (propensity to innovate) and enterprises' size</b>	<b>Micro enterprises</b>	<b>Small enterprises</b>	<b>Medium enterprises</b>	<b>Total</b>
Benefits of cooperation with enterprises (N=55)	78.3	80.3	82.2	80.1
Benefits of cooperation with BEIs (N=33)	33.3	30.0	26.6	27.2

Note: Source: own elaboration

Two main conclusions can also be drawn here. The data indicate the existence of a relationship between the size of the entities and their propensity for innovation. Firstly, the propensity to innovate (including the size criterion) measured by the benefits of cooperation with other companies is far higher (80.1%) than in the case of cooperation with BEIs (27.2). Secondly, while in relation to the “cooperation with enterprises”, the propensity increases in proportion to the size of the company, in the case of “cooperation with BEIs” this relationship is reversed. Hence, the other part of the adopted hypothesis must be verified negatively (for companies) and positively (for BEIs).

The other adopted partial hypothesis is that: little (or no) propensity for innovation among closed enterprises is determined by their high level of uncertainty concerning potential benefits of cooperation with the environment. To verify this hypothesis, the data showing the share of enterprises uncertain as to the effects of future cooperation among entities open and closed (for comparison) were used (Table 03). The below-presented data demonstrate the validity of the assumed hypothesis, since the general reluctance of closed SMEs to cooperate with the environment stems from uncertainty about the possibility of deriving tangible benefits, hence the low propensity to innovate. This proves the existence of the relationship between the propensity to innovate and openness to the environment. “Open” entities are characterized by a relatively small degree of “uncertainty” and hence tend to cooperate and implement new solutions to improve their attractiveness to domestic or foreign markets.

**Table 03.** Level of uncertainty regarding benefits derived from cooperation among open and closed SMEs (in %)

<b>Level of uncertainty and company's size</b>	<b>Micro enterprises</b>		<b>Small enterprises</b>		<b>Medium enterprises</b>	
	<b>Open</b>	<b>Closed</b>	<b>Open</b>	<b>Closed</b>	<b>Open</b>	<b>Closed</b>
Level of uncertainty regarding benefits from cooperation with enterprises (N=55 and N=48)	10.9	70.8	10.9	66.6	7.2	39.5
Level of uncertainty regarding benefits from cooperation with BEIs (N=33 and N=70)	48.5	92.8	33.3	90.0	26.6	81.4

Note: Source: own elaboration

Closed entities, on the other hand, “marked” by a high level of uncertainty, are prone to openness, hence the implementation of innovations, only to a small extent. Therefore, this hypothesis is positively verified, i.e. confirming the relationship between the propensity to innovate (basically its lack) and the enterprise's concept of operation (open or closed). While discussing the data in the table above, the attention should also be paid to the existing relationships between the size of the companies, their concept of operation and the degree of uncertainty relative to other entities or BEIs. In general, the larger the enterprise and the more open, the smaller the degree of uncertainty. This principle also applies to the cooperation with BEIs, in which the uncertainty (and thus the propensity to cooperate) is relatively the highest (with respect to open entities: 26-48% and closed ones: 81-92%).

The last of the adopted hypothesis is: SMEs cooperating with other enterprises in the environment rather than with business environment institutions are characterized by greater propensity (strength) to innovate. To verify this hypothesis, the data in Table 04 were used. The evaluation of the “strength” was made by scaling the benefits derived by SMEs from each of the (two) types of cooperation.

**Table 04.** Assessment of the strength of propensity to innovate broken down into cooperation with enterprises and beis (in %)

Scale of benefits and company's size	Cooperating with other enterprises		Cooperating with business environment institutions (beis)		Total	
	No.	%	No.	%	No.	%
Very poor	2	4.5	2	22.2	4	7.5
Poor	4	9.0	1	11.1	5	9.4
Average	18	40.9	4	44.4	22	41.5
Good	15	34.0	2	22.2	17	32.0
Very good	5	11.3	0	0	5	9.4

Note: Source: own elaboration

The above – presented data (table 04) allow the positive verification of the hypothesis according to which SMEs cooperating with other enterprises in the environment rather than with business environment institutions have a greater propensity to innovate. This follows directly from the assessments made by the companies, the vast majority of which assessed the benefits derived as “good” or “very good” (respectively for companies: 34% and 11.3% and for BEIs: 22.2% and 0%).

## 7. Conclusion

The positive verification of the adopted partial hypotheses also allows to positively verify the main hypothesis which assumes that: The use of the OI concept (open innovation) determines a greater propensity to innovate. This means that there is a cause and effect relationship between the propensity for innovation and the OI concept. The aim of SMEs is, therefore, to seek greater openness to the environment, thus increasing their ability to introduce and implement new (available in the environment) innovative solutions.

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