

THE EFFECTIVENESS OF THE INNOVATIVE PROCESS IMPLEMENTED BY SMEs.

THE RESULTS OF THE EMPIRICAL RESEARCH

Tomasz Norek

The University of Szczecin

Faculty of Economics and Management Services.

Abstract

The essence and the importance of innovation in the process of building the competitiveness of enterprises is widely described in the economic literature. But analysis of innovative activity of companies very often indicates that the innovations introduced to the market do not bring the expected benefits. This leads to the conclusion that very often the innovation activities of enterprises are inefficient and detailed analysis of such cases may identify the key barriers to implementing effective innovation.

The modern model for innovative activity indicates that one of the key factors for the success of the innovative activity of enterprises is the proper implementation of introducing new solutions to the market. The problem of the diffusion of innovation involves a number of issues related to the process of spreading and promoting innovation in the market. It is widely recognized that competencies in the area of innovation diffusion are a key determinant of the innovative potential of a company.

The author put forward the following research hypotheses:

Innovative activities carried out by the surveyed companies are inefficient.

The purpose of this paper is to present the problems associated with the effective diffusion of innovation in the SME sector in Poland, with particular emphasis on the barriers in this area. Commonly available statistical data, the author's empirical research results on innovation potential and results of other studies conducted by the University of Szczecin were used to prepare this publication.

Key words: Innovative process, SMEs innovative effectiveness

Introduction

The drivers of competitiveness growth in developed countries are innovations based on three pillars: R&D, knowledge and education. The effectiveness of innovative processes is becoming one

of the key measures of competitiveness. Innovations generate a significant added value for both industry and services and strengthen the competitive advantage of a national economy in the international market. Innovation is the key element to boosting efficiency and economic growth, particularly in the times of turbulent technological transformations. Development trends in highly developed countries point out that stable development is only ensured by building competitive advantage based on knowledge and successfully implemented innovations.

Poland is currently at a particular moment in its economic and social development. The existing competitive advantages, based mostly on lower labour costs, are fading. Therefore, it seems crucial to build competitiveness based on knowledge and innovation, with both being long-term constituents of economic growth.

Unfortunately, the innovativeness of the Polish economy still underperforms. The report, Innovation Union Scoreboard, published in 2012 by InnoMetrics research institute commissioned by the European Commission, shows that the Polish economy, as far as its Summary Innovation Index⁵⁴ is concerned, finds itself in 23rd place out of the EU-27 member states (the value of aggregated SII for Poland stands at 0.296, while the EU-27 average stands at 0.539)⁵⁵.

InnoMetrics scored companies from the SME sector's self-created innovation activity (Poland 13.76, while the EU-27 average is 30.31), cooperation between the SME sector in the area of innovations with other companies in the market (Poland 6.4 while the EU-27 average is 11.16) and the sale of innovative (new to the market or company) products and services (Poland 9.84 while the EU-27 average is 13.26) lowest.

Among positive factors fostering the innovativeness of the Polish economy one may find high potential in the area of innovation absorption – acquisition and implementation by Polish companies of foreign licences and patents (Poland 0.18 while the EU-27 average is 0.51), human resources (Poland 35.3 while the EU-27 average 33.6), opportunities for innovation funding and functioning of the innovation activity support system.

It is worth noting however that Polish innovation performance measured by SII in 2011 witnessed a fall compared with 2010 (SII stood at 0.304).

⁵⁴ The method for SII is described in detail in Innovation Union Scoreboard 2011, ISBN 978-92-79-23174-2

⁵⁵ http://www.proinno-europe.eu/page/summary-innovation-index-0#_ftn2

The 2012 World Bank ranking based on KEI (Knowledge Economy Index) also confirms the negative assessment of Polish innovation underperformance placing it in 38th position⁵⁶. The low assessment of Polish economy innovativeness is also seen in the Eurostat data collected in the Community Innovation Survey (CIS) that evaluates companies on the aspect of their innovation performance⁵⁷.

Polish innovation underperformance is particularly present in SMEs, which can have negative consequences linked to hampering the competitive advantage of the economy and causing the country's international marginalisation. Much research and many reports on Polish innovation performance touch on this aspect e.g. E. Horodyńska-Okoń, K. Piecha, W. Świtalski, M. Zastępowski, M. Pichlak.

Much national research (and some statistics published by e.g. Central Statistical Office) point to the fact that Polish companies frequently report a reasonably high level of innovation – especially in the area of the introduction of innovative products or services to the market as well as innovative solution absorption - *A. Żołnierski, Innowacyjność polskich przedsiębiorstw 2005, Raport PARP.*

Cognitive dichotomy highlights the existence of probable differences between the methodological definition and comprehension of innovation and the assessment failing to consider innovation performance aspects linked to expected results. Although the researched companies more often report implementation of innovation ventures, the effectiveness of these actions does not translate into a companies' results (measured by the main financial indices, e.g. product and service sales growth, profitability growth, operational costs reduction).

In the light of the above information, Polish innovation performance calls for the conducting of in-depth research and analyses in order to explain the present state of affairs.

The essence of innovation activity effectiveness implemented by companies

The notion of performance effectiveness is often applied in reference to economics, where it becomes particularly important in the areas of activity rationalisation and decision-making processes. The literature on the subject defines effectiveness as the capacity to produce

⁵⁶ Knowledge Economy Index Rankings <http://siteresources.worldbank.org/INTUNIKAM/Resources/2012.pdf>

⁵⁷ <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>

a desired effect, determined by the ratio of effect and expenditure [Stoner 1994]. The literature on the subject points out that innovation effectiveness is relatively rarely described (among others: Arundell, Bloch, Rosebusch, Sawang), however Polish literature lacks a full presentation of the influence of a company's resources on innovation effectiveness (among others: Karaganov, Karasek, Zastępowski). In the context of Polish economy innovation underperformance, the issue seems crucial, which triggers the need for research whose aim will be the calculation of precise methods of measuring and assessing innovation process performance and determining the effectiveness mechanisms of these processes.

The measure of effectiveness (both ex-post and ex-ante) is conducted using index methods based on individual and synthetic indices of resource utilisation productivity (e.g. labour, capital). Ex-ante effectiveness is calculated by assessing the expected effects engaging resources and time. Ex-post effectiveness considers the determination of the results of the implementation of a particular action.

The authors, focusing on the effective assessment of innovation activities, attempt to define the effectiveness of innovation performance (mainly in reference to defining the effectiveness of other company operations) and use the classic measures of effectiveness, based most frequently on the measurable features of innovation.

According to the literature on the subject [e.g. Brzeziński, 2001], in order to assess innovation performance, the same methods are applied as while assessing investment projects. Therefore, a wide range of innovation aspects are categorised as either technological, product or process forms, whose effects can be measures by financial tools. However, there is an issue with value and organisation innovations where it is hard to assess the expected returns and market success due to their complexity and the multifaceted nature of the possible effects and costs. It is suggested that there should be a differentiation between typical capital investment from the assessment of innovation implementation, as these ventures vary in; their objectives and manner of implementation, effects, methodology of expenditure and effect determination, result assessment conditions and the influence of other activity indices on change [Karganov, 2008].

Similar distinctions can be found in the list of types of company effectiveness proposed by A. Jaki [Jaki, 2008], who makes a clear division between effective investment and effective innovations. The author claims that such an approach is correct and validates the search for measurement methods and assessment of the effectiveness of innovation processes.

The above observations call for in-depth research on the essence of innovation process effectiveness and the attempt to determine measurement methods of innovation activity effectiveness which would consider their full picture and the complexity of innovation processes.

The starting point for the creation of a methodology of innovation activity effectiveness assessment may be a detailed analysis of innovation processes which occur in companies.

The measure of innovation activity effectiveness based on innovation diffusion process analysis.

The implementation of innovation ventures, regardless of company size and the type of implemented innovation, follows a pattern which is called by the literature on the subject the innovation process model [Drucker 1994]. The first models describing the implementation of innovation processes were proposed as early as the 1950s and 60s, push model and pull model are the traditional line models described in detail by the literature [Jasiński 1998; Stawasz 1999] which may serve as examples. The extremity of the first models of innovation process implementation, their passivity towards the external world and, highlighted by many authors, the necessity to include non-linear innovation processes [Janasz 1999; Kline 1985], led to the construction of further models of innovation process implementation. The most popular examples of innovation process implementation models include: *a chain-linked model* by S.J Kline and N. Rosenberg [Kline, Rosenberg 1986], *a coupling model* by R. Rothwell and W. Zegveld [Rothwell, Zegveld, 1985] and *a parallel model* by P. McGowan [McGowan 1996].

Later research on the essence of innovation process implementation was taken to further the evolution of the models by the development of innovation theory and practice in the area of innovation activities. The authors of the new proposals integrated innovation processes with practically every aspect of company operations, pointing to the fact that the existing company resources determine its innovation potential, namely the ability to successfully and effectively implement innovation ventures [Norek 2012]. In addition, the authors of the new models indicated the role and significance of the company learning process and knowledge management in reference to its innovation potential. The contemporary models of innovation processes implementation include: Fifth-generation innovation process [Rothwell 1995], systemic approach towards innovation process, spiral innovation process [Oslo Manual 2005], effective innovation management [Tidda, Bessant, Pavitt 2001].

Analysing contemporary models, one can clearly claim that the authors of each new proposal emphasised the importance of the diffusion stage and propagation of implemented innovations.

Diffusion of innovations as defined by the Oslo Manual is 'widely adopted through market and non-market channels starting at any place in the world' and refers to 'the manner in which innovations are propagated through market and non-market channels, from the first implementation to the contact with various consumers'[Oslo Manual 2005].

Diffusion of innovations can refer mainly to two groups of market participants:

1. Supplier diffusion - companies offering products and services. Diffusion of innovations in this group refers to making products commonplace (imitation) or the application of similar processes, organisational or marketing solutions. Diffusion can result from formalised transfer of technologies through buying licences and rights to use innovations implemented by other companies [Jasiński 2006].
2. Buyer diffusion – refers to the participants of the consumer markets. Diffusion refers to the principles of new product and service introduction to the markets, promotion of ingenious techniques and operations, publicising of state of the art ideas and concepts. The main objective of diffusion process operations is the maximum adoption of innovations by the highest number of buyers or adopters (as innovations is not always purchasable).

In conclusion we can claim that diffusion of innovations determines the principles of innovative product and service market commercialisation and is the element of the innovation process which is directly responsible for the market success of new products and services. Therefore, one can assert that without diffusion of innovations, innovation would not hold any economic significance [Kilnciewicz 2011], which causes many scientists to regard the issue of diffusion as key to effective implementation of innovation processes [Klein, Sorra 1996; Angle, Van de Ven 2000].

Moreover, stressing the importance of the diffusion of innovations, knowledge on this topic is indispensable in creating product and marketing strategies in companies that implement innovative products and services.

Research on the diffusion of innovations may prove vital in explaining company problems in the area of effective implementation of innovation processes. The significance of the diffusion of innovations in the process of effective innovation performance is confirmed by a number of researchers: e.g. E.M. Rogers, K. Kilnciewicz.

The effectiveness of innovation processes can be analysed on two levels:

1. Diffusion of innovations – refers to the effectiveness of a company's innovative product and service implementation on the market
2. Absorption of innovations – a company's ability to absorb innovative solutions generated by other companies

Accepting the above understanding of innovation activity effectiveness in the process of effectiveness assessment at both diffusion and absorption levels, a number of indices can be applied, e.g.:

1. Innovation sales level
2. Innovation sales success index
3. Innovation advancement in researched companies
4. Level of customer acceptance of new products and services
5. Level of effectiveness of the diffusion processes of new products and services

The above presented indices clearly and directly assess the effectiveness of innovation activities based on quantified financial values enables the precise assessment of the effectiveness and comparison of innovation activity results. In order to conduct a more in-depth analysis of innovation process effectiveness one can construct other indices: e.g. profitability of innovation activities or their cost.

Assessing the effects of innovation activities we can attempt to prepare indices assessing diffusion and absorption of innovations in their financial, product, organisational and marketing aspects.

In the following part of this paper the author conducts a basic analysis of innovation diffusion process effectiveness in Polish companies of the SME sector.

Analysis and assessment of the effectiveness of innovation activities of the Polish SME sector. Research method.

Looking into the reasons for the low innovation performance of the SME sector [Norek 2013] the author paid particular attention to the barriers linked to the effectiveness of innovation process implementation. He conducted in-depth analysis on the dependencies between the level of company innovation, innovative products and services sales, the index of success achieved; and the dependency of new product or service adoption by customers and the real possibility of their commercialisation.

The research objective is conducted based on the inductive logic method which focuses on the analysis of the diffusion of innovation processes

in SMEs. The research assessed all key determinants influencing the effectiveness of innovation activities. It was carried out through a questionnaire containing 43 questions divided into eight categories – innovation process stages implemented in a company. The detailed methodology is described in the author's other publications [Norek 2011].

Analysing the above features and the effects of diffusion processes, the author formed the following research thesis: *Innovation activities implemented by the researched companies is ineffective.*

Within the assessment of individual categories, the companies conducted the assessment of selected aspects of their operations in a given area. The internet questionnaire was carried out over the period of April 2012–August 2012.

200 companies from three regions of Poland were selected for the analysis:

1. Zachodniopomorskie - medium innovation performance voivodship
2. Podkarpackie - low innovation performance voivodship
3. Mazowieckie - high innovation performance voivodship

The selection of companies focused on ensuring an adequate research structure: 45% (90 enterprises) manufacturing companies, 55% (110 enterprises) services. The division into company size was the following: 39% (79 enterprises) micro companies, 47% (94 enterprises) small companies, 13.5% (27 enterprises) medium-sized companies.

The research sample was standardised by statistical methods considering the economy structure of these individual voivodships, company size and the prevailing type of conducted activities (Table 1.). The author is fully aware of the fact that the analysed sample is not representative, however it is a sufficient number to carry out the analysis and draw conclusions.

Due to the nature and volume constraints of this paper, the author presents only a number of selected results which enable the assessment of the effectiveness of innovation activities of the companies. The author carried out in-depth analysis of, among others, the following features describing the diffusion of the innovation process:

1. Innovation sales level;
2. Innovation sales success index;
3. Innovation advancement of researched companies;
4. Level of customer acceptance of new products and services.

Table 1. The structure of the research sample

Size	Voivodship	Type of activity		Total
		Manufacturing	Services	
Small	Mazowieckie	17	22	39
	Podkarpackie	16	15	31
	Zachodniopomorski e	8	16	24
Small total		41	53	94
Micro	Mazowieckie	17	16	33
	Podkarpackie	9	11	20
	Zachodniopomorski e	10	16	26
Micro total		36	43	79
Medium-sized	Mazowieckie	4	5	9
	Podkarpackie	5	4	9
	Zachodniopomorski e	4	5	9
Medium-sized Total		13	14	27
Total		90	110	200

Source: Own work.

The level of company innovation is determined through the placement of new products or services in its offer over the last three years, regardless of market success. The term ‘success index’ signifies the number of new products or services offered by a company over the last five years which were accepted by the market after their implementation. The assessment is complemented by the indices referring to the relationship between new product/service sales income and profits, and a company’s turnover over the last three years. The stand out companies in this respect are the companies for which the values of the above indices exceeded 30%, if the values are at about 1% the companies are regarded as the weakest. Such a range description is widely accepted in company innovation research and innovation audits. Aggregated results are presented in Table 2.

Table 2. Key indices of the effectiveness of the diffusion of innovation process implementation in the researched companies

Type of activity	Category	< 1%	2% - 10%	11% - 20%	21%-30%	> 30%
Services	Innovation sales	27%	27%	22%	18%	6%
	Success index	31%	29%	19%	17%	5%
	Innovation level	29%	24%	23%	19%	5%
Manufacturing	Innovation sales	25%	30%	22%	14%	9%
	Success index	15%	23%	27%	25%	10%
	Innovation level	24%	22%	26%	20%	8%
All	Innovation sales	26%	28%	22%	16%	8%
	Success index	23%	26%	23%	21%	7%
	Innovation level	27%	23%	25%	19%	6%

Source: Own work.

The results highlight that half of the researched companies (50%) are innovation underperformers (innovation level <10%) which puts them in the non-innovation category. As little as 6% of the companies can be regarded as innovative, namely those which over the last three years implemented new products or services (innovation level >10%). The results show that the companies do not possess sufficient innovation potential, which conditions the implementation of innovative ventures. The author's earlier research proves this thesis and points to the fact that the companies' lowest innovation potential occurs in the areas of innovation activity estimation and planning, communication, organisation and innovation activity funding [Norek 2012]. Detailed results of the percentage of innovative product sales in total company profits are presented in Table 3.

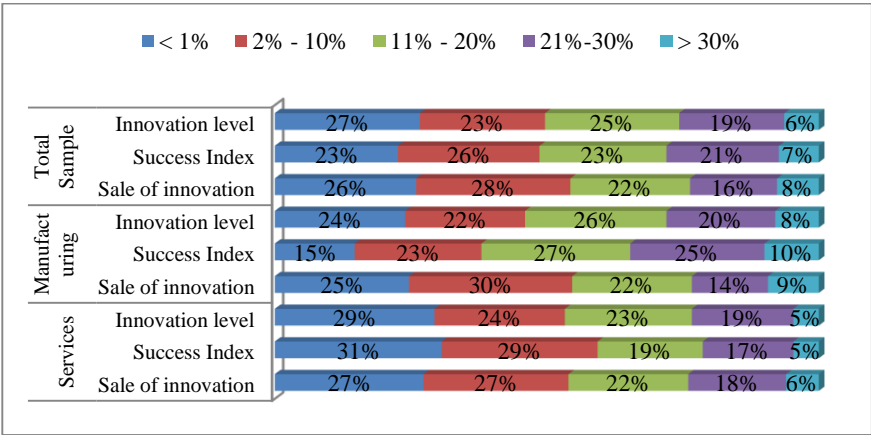
Table 3. Average percentage of profits from innovation sales

Company size	Type of activity		Final average
	Manufacturing	Services	
Small	9.8%	8.9%	9.35%
Micro	8.24%	6.49%	7.37%
Medium-sized	13.34%	12.78%	13.06%
Final average	10.5%	9.39%	9.93%

Source: Own work.

Medium-sized companies (13.06%) show a decisively high effectiveness determined as a percentage of the profits from innovations sales while micro companies scored the lowest (7.37%). Manufacturing companies reached a slightly higher percentage of profits from innovations sales – this score may come as a surprise as it is commonly believed that manufacturing companies are more innovative than services. The author’s research does not confirm this state of affairs in reference to the effectiveness of innovation activity implementation.

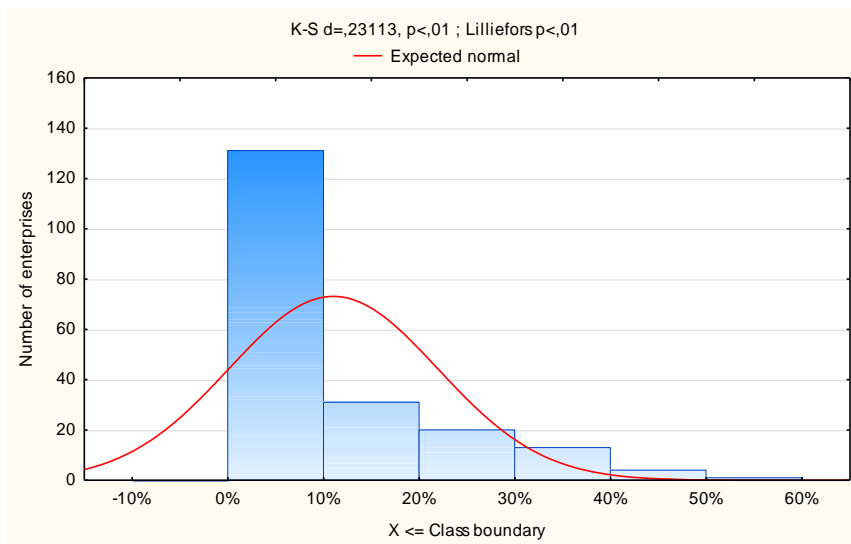
The index of market acceptance of innovations, which describes the effectiveness of diffusion, may complement the research results. The index is very unfavourable for the companies since as many as 49% score below 10% on the success index. As few as 7% of the implemented innovations were accepted by the market – with the success index above 30%. The achieved values should be regarded as unequivocal proof of the low effectiveness of the diffusion of innovations, which stems from the companies’ insufficient potential in this area (Graph 1).



Graph 1. Key indices of the effectiveness of the diffusion of innovation process implementation in the researched companies referring to type of company activity

Source: Own work.

The innovation sales index determines the financial aspect of poor diffusion of innovation process implementation. As many as 54% of the companies report that profits from innovation sales are below 10% of the total profits, while 8% of the firms report that over 30% of profits are from innovation sales (Graph 2).



Graph 2. Histogram of percentage of profits from innovation sales in researched companies and expected value of normal distribution

Source: Own work.

The presented results show that slightly lower scores are registered by manufacturing companies than services, however the difference is not significant. The results, presented in graphic form, are shown in Graph 1. Graph 2 shows a histogram of the percentage of profits from innovation sales in researched companies and expected value of normal distribution – the histogram also confirms the poor effectiveness of innovation process implementation, determined by the profits generated by innovative product sales. The distribution of the percentage of net profits from innovation sales lies to the left, which indicates the profitability from innovation sales is lower than expected.

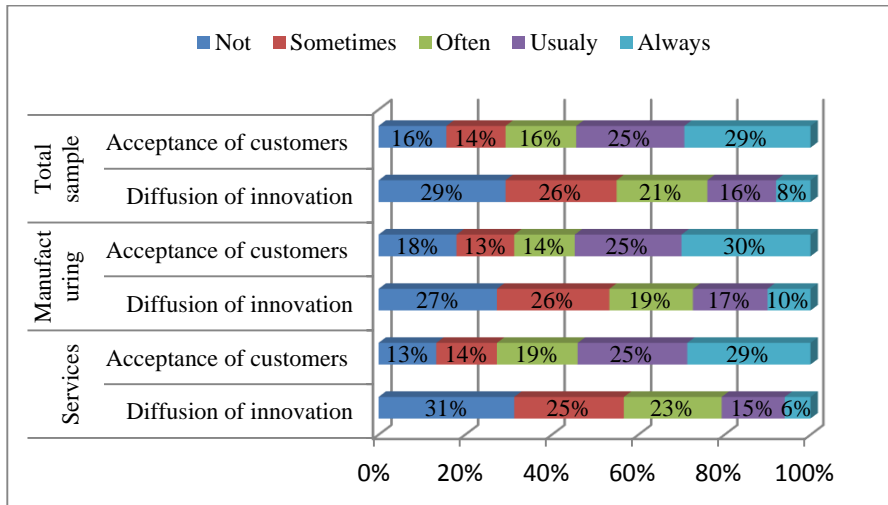
The next in-depth analysed category was on the dependence between customer acceptance of new products or services and the effectiveness of their diffusion. The results led to an unequivocal assessment of the diffusion of innovation process implementation in the companies of the SME sector and are presented in Table 4.

Table 4. Dependence between customer acceptance for the implemented innovations and diffusion effectiveness

Type of activity	Category	No	Sometimes	Often	Regularly	Always
Services	Innovation diffusion	31%	25%	23%	15%	6%
	Customer acceptance	13%	14%	19%	25%	29%
Manufacturing	Innovation diffusion	27%	26%	19%	17%	10%
	Customer acceptance	18%	13%	14%	25%	30%
Total sample	Innovation diffusion	29%	26%	21%	16%	8%
	Customer acceptance	16%	14%	16%	25%	29%

Source: Own work.

The results show that despite the fact that 29% of implemented innovations were always accepted by customers, the diffusion of a mere 8% resulted in full market success. The results prove that the companies, despite having valuable new products and services that earned customer appreciation, are unable to conduct an effective process of their market diffusion. This is yet another confirmation of the thesis of ineffective innovation activity of the researched companies of the SME sector. The results are presented in Graph 3.



Graph 3. Dependencies between customers acceptance and diffusion effectiveness of implemented innovations

Source: Own work.

Summary

The author proposed the thesis: *Innovation activities implemented by the researched companies are ineffective*. Such low potential in the area of effective implementation of diffusion processes is one (not the only one as other author's research show) of the determinants of low innovation performance of the Polish SME sector.

As the paper proves, a precise assessment of the effectiveness of innovation processes implemented by SMEs is methodologically challenging, which is reflected in the literature quoted by the author. Nevertheless, this issue, particularly in the light of Polish economic underperformance, is significant and requires in-depth studies.

In order to confirm his thesis, the author conducted empirical studies whose results have been presented in this paper. They clearly confirm the low effectiveness of innovation activities of the companies of SME that formed this research. The results enabled the formulation of reasons for such a state. It seems that that the low effectiveness of the innovation activities of the SME sector is influenced by the low innovation potential of these companies – stemming from companies own resources utilised in innovation processes.

Despite the fact that 29% of implemented innovations always received customer acceptance, diffusion of only 8% was considered to have gained full market success. As many as 54% of the companies reported that the profits from innovation sales scored below 10% of the total profits, whereas only 8% reported that over 30% of profits come from innovation sales.

Another confirmation of the author's thesis of the low effectiveness of innovation activities of the companies are the results of the index describing the market acceptance of implemented innovations. The companies tested, scored especially poorly as 49% of them regarded their success index below 10%, only 7% of the implemented innovations met market acceptance – the success index is over 30%. The collected values can be regarded as undeniable proof of the low effectiveness of innovation diffusion implementation.

The quoted results juxtaposed with the reported level of innovation (expressed as the ratio of the offered innovative products and services) of the companies additionally reinforce the negative assessment of the effectiveness of innovation diffusion implementation.

The results should lead to in-depth studies in this area. A detailed 'case study' type of research seems advisable to assess the effectiveness of innovation processes during which diffusion processes of individual

innovations would undergo a specific and comprehensive analysis. Such research – thanks to an accurate description of the innovative process – would help to point out the mistakes committed by companies during the implementation of diffusion processes.

Equally valuable information would be provided by studies of change dynamics in the effectiveness of diffusion process implementation over an extended period – this would lead to conclusions and evaluations about whether SMEs are increasing their competences in this area. The author has at his disposal, data on innovation process implementation in companies over the period 2009-2012. Such a range of data will enable in-depth research into the dynamics of this phenomenon.

Comparison of the effectiveness of the innovation activities of Polish companies against those from other countries, especially innovation leaders such as Denmark, Finland or Sweden, would be another complementary study and would help to identify the innovation gap between the compared countries. Such a study may be based on the author's research and the widely available statistics, e.g. published by Eurostat.

Another direction of research into the effectiveness of innovation process implementation may be the idea proposed by N. Rosebusch, J. Brinckmann and A. Bausch which combines the effectiveness of innovation processes with company size, length of operating on the market or organisation culture – one of the resources constituting company innovation potential [Rosebusch, Brinckmann, Bausch 2009].

The author advocates the idea of the creation of a comprehensive model for the assessment of the effectiveness of innovation processes implemented by SMEs, which would describe in the most precise manner the nature and complexity of innovation processes.

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