

Innovations in Risk Management as Exemplified by the Polish Insurance Market

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Abstract: The era of knowledge based economy, which the world is dynamically entering, reveals many new factors and necessities which a modern company needs to consider and cope with if it wishes to stay on in business. The innovativeness of business activity, in a broad meaning of the word, is an area of significant factors. Holistically, one may ask about the borders of innovation applied in business. Are they determined by: the actual needs of end consumers and as a consequence the needs of companies participating in the chain of value delivered to these customers or primarily the actual needs to earn on corporate investments on the customer value chain?

This paper analyses the problem of management of innovation programmes and projects introduced by companies from the microeconomic perspective. Its main aim is to show a new approach to innovation cost management and the innovation activity of the insurance sector in Poland. The paper consists of two sections. The first one describes innovation cost management. Innovative companies should be supported by the insurance sector. They should also apply knowledge and appropriately analyse and allocate costs within the algorithms of behaviour compliant with the risk management. The second section analyses the Polish insurance sector with the Multivariate Statistical Analysis. The paper ends with the conclusions with regard to the insurance sector. The examination of the sector shows that the insurance market in Poland in the analysed period was not innovative and it did not create innovation supporting services (and it is where the insurance risk appears due to the financial aspects of innovation).

Keywords: Innovation, cost management, risk management insurance.

INTRODUCTION

Irrespective of the place and time every business activity is risk related. The specific risk factors, risk level and the availability of tools to manage the risk are characteristic of a "given place and time".

The era of knowledge based economy, which the world is dynamically entering, reveals many new factors and necessities which a modern company needs to consider and cope with if it wishes stay on in business. The innovativeness of business activity, in a broad meaning of the word, is an area of significant factors. Innovativeness is a sign of the era of the knowledge based economy and what is characteristic of this era is the fact that its "soft" borders are marked only by business ethics. Holistically, one may ask about the borders of innovation applied in business. Are they determined:

- by the actual needs of end consumers and as a consequence needs of companies participating in the chain of value delivered to these customers or primarily
- by the actual needs to earn on corporate investments on the chain of value for customers?

This paper does not attempt to answer this question. It analyses the problem of management of innovation programmes and projects introduced by companies from the microeconomic perspective. Bearing this in mind, it is necessary to distinguish three areas to focus on in an innovative company:

- A) knowledge management and diagnosis of innovation potential,
- B) innovation cost management,
- C) innovation management in the risk conditions.

Innovations, i.e. something new, with no standard set before or only to a certain extent based on well-known models and solutions in each of the aforementioned areas give rise to a specific uncertainty in business activity. Thus, the undertaking of the innovation activity should be preceded by an attempt to identify the risk factors, which may allow for its limitation once identified within this uncertainty. Knowing the risk factors one may undertake attempts to manage in the conditions of risk, which, grossly simplified, may be understood as the application of preventive instruments and solutions focused on the identified risk factors and thanks to it preventing the potential implementation of risk with effects of the scale initially predicted or refunding the incurred losses as a result of the implementation of this risk.

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I. KNOWLEDGE MANAGEMENT AND INNOVATION POTENTIAL DIAGNOSIS

Innovations always require a new "knowledge" and high "organisational efficiency." Thus, they are stuck in the corporate "intellectual capital" (human, organisational and relative). Innovations may occur only in those companies in which this capital actually exists and is reflected in the competences of the managerial staff.

Presently, one of the innovation underlying skills is the so-called knowledge engineering or data mining. This skill consists in the ability to reveal the knowledge hidden in different sources of scattered data, e.g. in databases and may have a great impact on the decision to undertake an innovation process and to determine the way of its implementation.

In the context of innovation, the acquisition of a broadly perceived new knowledge is only one of the aspects of the corporate knowledge management. Another aspect to be considered is an assessment efficiency skill: (1) its business usefulness, (2) risk related to its potential application, (3) advantages resulting from its application. The skill is a starting point for the launch of the innovation process. For this reason, it is indispensable to recognise the corporate innovation potential, at least in these areas of competence. It is a prerequisite for the innovation process management, especially when this process is accompanied by uncertainty and different risk factors, which is discussed later.

II. INNOVATION COST MANAGEMENT

From the microeconomic perspective, disregarding the reason for innovation activities, it may be easily stated that "business success" measured for example with the market value growth is achieved by the companies which accurately prepare their innovations. The very idea of innovation is insufficient although it is a driving mechanism of the whole innovation project. If innovation is to be effective, it needs to be implemented, and this is connected with costs related to the innovation undertaking. At present, when it is generally claimed that a company is a source of costs not incomes, the development of corporate competence within the innovation cost management is crucial. The discussion below presents the authors' self-designed approach to the problem of innovation cost management in a single company.

In the area of innovation undertakings cost management the risk factors are found on two cost

planes: *ex ante* (planned costs) and *ex post* (incurred costs). In order to identify these factors it is necessary to:

- (1) define the cost object appropriate for the adopted notion of innovation,
- (2) define the cost model which will determine the information structure of innovation undertaking costs,
- (3) set the system of records of the incurred innovation costs and the system of controlling,
- (4) set the method of monitoring of innovation undertaking cost effectiveness in the course of the whole period of the "innovation effect."

Re. 1)

The definition of the cost object is derived from: (1) the corporate perception of innovation, (2) the ability to classify innovations according to their kinds as well as (3) the identification of the innovation process stages and (4) activities conducted during these stages.

From the microeconomic perspective, innovation is a solution suitable for business application and constituting a novelty, at least from the perspective of the company launching this solution.¹

The definition of the cost object does not need to consider classifications based on their importance. It is not significant whether it is a breakthrough, original or imitative innovation. What is important is the criterion of the field of innovation which may be the company's product offer, a process conducted in the company or the organisation of selected activity and the process of reaching the introduction of changes within these innovation fields.

Bearing this in mind, the material presented below (Table 1) may constitute a starting point of the considerations on the innovation process cost, which is at the same time a demonstration of the features of (components) the cost object under discussion.

¹Innovation notional review according to among others: Schumpeter J. 2000. (early 20th century), Programme for better economic competitiveness of the EU member countries (called the Lisbon Strategy). Stern S., Poter M., Furman J.L., Oslo methodology and the Polish Central Statistical Office, Guidelines of the Ministry for economy and Labour for the needs of the Polish Agency of Development of Competitiveness (PARP), see: Boniecki M., Grabowski R. 2007. Parametry charakteryzujące innowacje (Parameters characteristic of innovation), [in:] Karmańska A. 2007. ed., Zarządzanie kosztami jakości, logistyki, innowacji, ochrony środowiska (Quality, logistics, innovation and environmental protection cost management): Difin, Pp. 120-129.

Table 1: Phases, Stages and Activities as Cost Drivers in Cost Object Implementation – Innovation Process

Cost drivers of a cost object – innovation process				
Kind of innovation: product – process – organisational innovation	Phase	Stage	Cost characteristics	Activity
		FI. Research	EI.1. conceptualisation of research	the costs of activity implementation including the planning and organisation of the research process of innovation projects
D.I.1.2.				
(...)				
D.I.1.n.				
EI.2. research process implementation			the costs incurred in relation to research completing the existing state of knowledge important for innovation projects; costs of development of scientific idea to the practically useful form; the cost of creation of vision (of a project) of product, process of organisational innovation	D.I.2.1.
				D.I.2.2.
(...)				
D.I.1.n.				
FII. Research work		EII.1. conceptualisation of re-engineering of innovation implementation conditions	the costs of setting the scope and method of reengineering of corporate conditions to the form suitable for the introduction of innovation solutions; the costs of technical and business documentation for the future phase of business application of innovation	D.II.1.1.
				D.II.1.2.
				(...)
				D.II.1.n.
	EII.2. implementation of re-engineering of innovation implementation conditions	the costs of work on the transition from the research phase to the project operational phase; costs of launching the reengineering of conditions, e.g. the preparation of manufacturing space, retooling machines and equipment, reorganisation of work and staff training	D.II.2.1.	
			D.II.2.2.	
(...)				
Dz.II.2.n.				
FIII. Operational activity with application of innovation	EIII.1. phase of business use of innovation	the costs incurred in relation to the newly manufactured product or commercial application of a new technological process or a new organisational solution	D.III.1.1.	
			D.III.1.2.	
			(...)	
			D.III.1.n.	
	EIII.2. innovation effectiveness monitoring during its business life rime	the costs of new solutions with regard to monitoring of innovation undertaking cost effectiveness during the whole period of "innovation effect" and controlling in the same scope.	D.III.2.1.	
			D.III.2.2.	
(...)				
D.III.2.n.				

Source: authors' own material.

The generic cost drivers in the process of innovation appear in the activities conducted at every stage of every phase of the innovation process. The drivers are identified as a stage or phase of innovation process are exclusively synergic aggregates of generic drivers. The presented concept of the structure of innovation undertaking cost drivers (implemented in the process of innovation) is a visualisation of the cost object, i.e. the innovation process and is a starting point for the cost management related to this process.

Re. 2)

Both on the plane *ex ante* and *ex post* it is important to determine the model of allocation and cost calculation, thanks to which it will be possible to subordinate the cost (*ex ante* and *ex post*) to the

activities isolated in the innovation process. The concept to be seriously considered is the time driven activity based costing (TD-ABC), which may be relatively easily applied in the area of cost management. It is possible to: (1) identify detailed activities making use of the presented visualisation of the innovation process (see Table 1 for example D.II.2.n) and (2) effect cost allocations applying an understandable cost allocation key, which is a man-hour in the TD-ABC concept. Considering the issue of a cost model appropriate for application with regard to the innovation process, it also has to be decided whether the activities in the innovation process will be allocated with costs indirect for these activities, i.e. costs of other activities not occurring in the innovation process but the ones whose implementation determines the corporate potential to undertake the

innovation process. In this place, taking into account the degree of complexity of cost calculations, the cost of conducting them as well as a doubtful information management value of the result of cost calculation, it is suggested that full-costing concept should be rejected and the concept of activity costs directly connected with the innovation process, i.e. direct-activity-costing should be applied instead.

Re. 3)

Innovation cost management, like cost management in other areas, requires information not only about the innovation costs planned but also those incurred. Furthermore, this kind of management should be a permanent process with regard to all the detailed activities isolated within the innovation process, which means that, with regard to every individual activity, it is indispensable to:

1. classify, register and calculate the costs of activity,
2. report the costs incurred,
3. determine cost creating factors with no value added to the activity,
4. introduce reengineering focused on the elimination from the activity of the factors with no value added to it,
5. control the cost effectiveness management of the activity.

The classification, registration and calculation of costs requires an appropriate structure of codes in the company allowing for an easy identification of the incurred costs and associating them with the place they come from, which in the case of innovation processes are the activities isolated in it. These codes are also useful in cost aggregate creation including cost values of, for example, a selected group of activities. The inclusion in the account books of the changes resulting from the application of TD-ABC as well as related detailed solutions will require special instructions and staff training but the advantage from the possession of cost information dedicated to the innovation process cannot be disputed. These costs abundant in extensive detailed classification obtained due to the accurate definition of the cost object and its internal activity classification, create a well-developed information base for cost controlling, which may use different models of

causal analysis of deviations as well as the analysis of operation quality and as a consequence the whole process.

Re. 4)

Some special attention should be paid to the information structure of the report on the innovation process costs. This report is indispensable for the cost controlling of this process.

Two managerially useful concepts of the report structure may be offered. The first one is presented in Table 2.

This concept allows for the innovation process cost controlling both in the aspect of structure and dynamics. Additionally, if in the calculation of *ex ante* cost value – for each activity in the innovation process – target costing is applied, one may speak about the applications of management of costs before they are incurred. The management of costs before they are incurred may determine even 90% of costs which will be incurred later. It is possible thanks to the best standard of activity implementation and adequate costs to this benchmarked standard.

The other proposal of managerial report may be an extended version of the report presented in Table 2 by the information about the kinds of incurred costs (*ex post*) in individual activities, e.g. materials used, remuneration purchased services etc. Such a report is managerially significant particularly in the area analysis of resources used in the innovation process and the assessment of the legitimacy of their use.

When looking at the proposed information structure of the innovation process costs it should be noted that the first phase, i.e. research is an area of intensive uncertainty. The idea of research is the "search for a new knowledge" and there is no certainty whether or not the new knowledge will be acquired. If it is feasible, there is a question when and what it will include and whether it will be useful for the company. In every phase there is "uncertainty" specific to a given phase. In the innovation process management in the conditions of risk, in all the phases there is a group of the same risk factors which appear in every phase. It is determined by the financial possibilities of activity implementation connected with the innovation undertaking in a given phase, the activity technical feasibility and the creative competence (creativity) of the staff conducting a given activity.

Table 2: Proposed Report Structure

Cost pool codes		Activity	Costs ex ante t=1 (1)	Costs ex post t=1 (2)	Deviations t = 1 (2)-(1) (3)	Costs ex post t = -1 (4)	Change in % (2)-(4)/(4) (5)	
FI	E1	D.I.1.1.1.	Analysis of needs ...	x	x	x	x	%
		D.I.1.1.2.	Diagnosis of possibilities ...	x	x	x	x	%
		(...)	Research visualisation ...	x	x	x	x	%
		D.I.1.1.n.						
	Total			x	x	x	x	%
	E2	D.I.2.1.	Studying problem ...	x	x	x	x	%
		D.I.2.2.	Simulating and modelling ...	x	x	x	x	%
		(...)	Experimenting....	x	x	x	x	%
		Dz. I.1.n.						
	Total			x	x	x	x	%
Total			x	x	x	x	%	
FII	E1	D.II.1.1.1.	Reingeneering design...	x	x	x	x	%
		D.II.1.1.2.	Forecasting and scheduling...	x	x	x	x	%
		(...)	Documenting ...	x	x	x	x	%
		D.II.1.1.n.						
	Total			x	x	x	x	%
	E2	D.II.2.1.	Restructuring...	x	x	x	x	%
		D.II.2.2.	Equipment...	x	x	x	x	%
		(...)	Training ...	x	x	x	x	%
		Dz.II.2.n.						
	Total			x	x	x	x	%
Total			x	x	x	x	%	
Total	Total		x	x	x	x	%	
Total			x	x	x	x	%	
FIII	E1	D.III.1.1.1.	Manufacturing ...	x	x	x	x	%
		D.III.1.1.2.	Application...	x	x	x	x	%
		(...)	Making use...	x	x	x	x	%
		D.III.1.1.n.						
	Total			x	x	x	x	%
	E2	D.III.2.1.	Reporting...	x	x	x	x	%
		D.III.2.2.	Analysing...	x	x	x	x	%
		(...)	Intervening....	x	x	x	x	%
		D.III.2.n.						
	Total			x	x	x	x	%
Total			x	x	x	x	%	

t = 1 – current period.
t = -1 – analogous former period.
Source: authors' own material.

Re. 5)

Setting the method of monitoring the innovation undertaking cost effectiveness during the whole period

of the "innovation effect" is the core of assessment of advantages resulting from the innovation process. It seems that an auxiliary indicator may be the formula based on the scrutiny on the dynamics of EVA

(Economic Value Added) value set for the third phase of the innovation process at a given moment of analysis in connection with the sum of costs value calculated *ex post* for the completed phases (1 and 2) of the innovation process and the accruing cost value of the third phase. There should scrutiny should follow during the whole period of economic life of the third phase of the innovation process.

The concept of the authors' self-designed formula may be presented in the following way:

$$EI = \frac{EVA_{3rd\ phase}}{\sum_{phase\ i} Cost_{phase\ i}} + \sum_{phase\ n} Cost_{phase\ n}$$

phase t

where:

EI – innovation process effectiveness ratio

i – the 1st and 2nd phases completed, isolated in the cost object – innovation process

t – period of implementation of the 3rd phase, isolated in the cost object – innovation process

III. INNOVATION MANAGEMENT IN THE RISK CONDITIONS

The implementation of the assumptions and goals formulated earlier and connected with the use of human resources and material assets poses, for the entity undertaking this sort of tasks, numerous problems related to decision making and activities which make up the process of management. It is worth noting that the decisions and activities in the management process are related to risk, which is an inherent quality of any activity. Hence, there is a term in the English language: Risk Management, which can be interpreted as management in the conditions of risk. Implementing five basic functions of the management process (planning, organisation, chain of command, coordination and control), a business entity is exposed to the implementation of risk, both pure and speculative. The risk management procedure consists in working out and using instruments which would raise the effectiveness of the management process with regard to the formulated assumptions and goals. In the majority of considerations we are confined to the pejorative understanding of risk, i.e. we identify the implementation of risk with a loss, which does not fully correspond to the situation of entities interested in business activity. The innovation activity risk whose

implementation may bring considerable profits may be a typical example. The innovation process requires support. The companies which implement innovations need support due to a special kind of activity connected with entering new unexplored areas and uncertainty related to it. The innovation process should be properly managed from the stage of planning to implementation and launching. We can see an important role of risk management and insurance as a method of minimisation of the effects of implementation of a given risk. Through the minimisation of effects of undertaken activities (risk related), companies may be more willing to undertake innovation activities. There is an important question to be asked whether the implementation of risk causes an impulse to innovation activity or on the contrary the innovation activity causes a higher exposure to the implementation of a given risk. In this part of the article we would like to present the research results concerning the development of the insurance sector in Poland. These results constitute the basis for an attempt to answer the question: Does the insurance sector through an appropriate offer and other behaviours which may be perceived as elements of the risk management process support the development of corporate innovativeness or is it rather passive focusing on risks already diagnosed (fire, flood, theft or accident). Due to quantitative limitations, the article presents only the most important research results and conclusions resulting from them.

3.1. Insurance Sector – Results of Analysis

Methodology Used

Two groups of measures are used in this study: measuring the distance and measuring similarity (Michalski T., Golebiowska E., 1996). The research was conducted by means of the multidimensional statistical analysis. Because of the comparative procedures (comparison of the same entity in different periods) taxonomic procedures were used. The comparison was made with regard to the development of the insurance sector consisting of four subsectors: *catastrophe insurance, life insurance, health insurance and financial insurance*. In each subsector there were three groups of diagnostic features. Before the beginning of research the database was created including the implementation of selected diagnostic features in the years 1991-2010 (the features are presented in Supplementary Table 1). Eventually, the number of features was decided after the analysis of correlations between them; whereas the length of observation series was determined by means of

availability of implementation of features from all the groups.

The database includes the implementations of diagnostic features for the analysed period. Initially it was planned to conduct the analysis of the years 1991 - 2010. However, the gathered data allowed for the full comparisons with regard to the period 2000 - 2010 (due to the availability of the feature implementations from all the groups). The period of the last 10 years may be regarded as interesting from the perspective of economic changes. In this time there was a period of good economic situation as well as a slowdown (the 2007 crisis).

The construction of the database was based on the information from reliable statistical sources published by the following institutions: the National Bank of Poland, the Central Statistical Office, the Financial Supervision Authority, IMGW and the Ministry of Health.

The analysis of the obtained correlation coefficients justifies the use of all diagnostic features. We remain with the expert selection, although we discern

correlations which as a consequence of the use of statistical methods of selection of diagnostic features would cause the elimination of some features.

Next, the assessment made of the sector development directions in the selected years of the analysed period. For comparison, the benchmark was set. In our case the benchmark was set in the group of experts based on algorithms presented by well-known statisticians (Z. Hellwig), separately for individual kinds of diagnostic features. In the case of stimulants the benchmark was calculated as a diagnostic feature of maximum value in the analysed period increased by a standard deviation for the whole time series. In the case of destimulants the benchmark value is 0 or minimum value decreased by a standard deviation, depending on which of the two values is higher. For nominants the benchmark value was set as an average value increased by a standard deviation or median depending on the character of the feature and the number of available observations. In order to maintain the clarity of the presentation the radar charts were used. The chart axes are the analysed subsectors (in the case of sector analysis) or feature group (in the

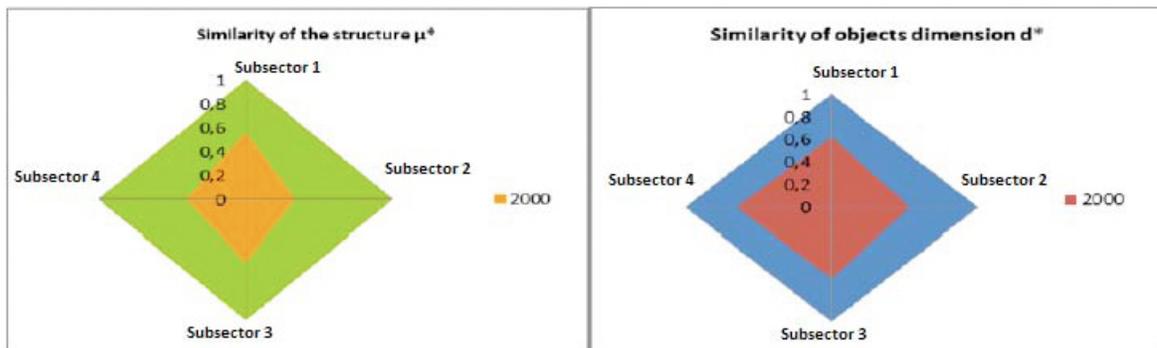


Figure 1: Similarity of structure and dimension in 2000 in comparison to a reference object. (A reference object is market yellow and blue colour).

Source: author's own materials.

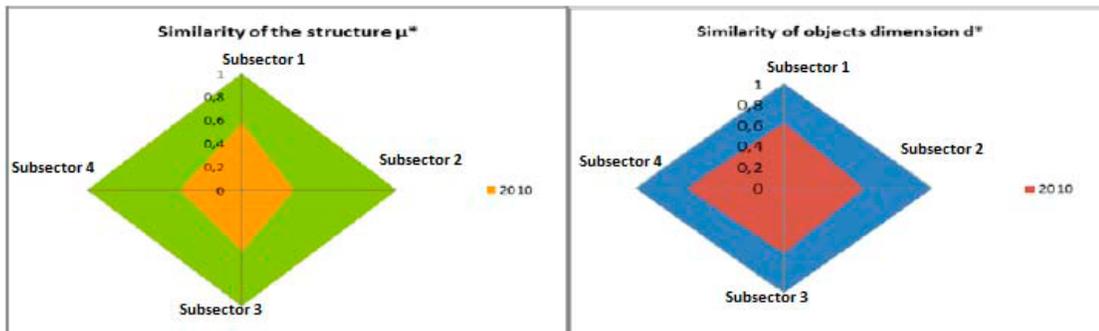


Figure 2: Similarity of structure and dimension in 2010 in comparison to a reference object. (A reference object is marked yellow and blue).

Source: authors' own material.

case of subsector analysis). Thus, Subsector 1 stands for catastrophe risk; Subsector 2 for life insurance; Subsector 3 for health insurance and Subsector 4 for financial insurance. The results of calculation for the measure of differentiation of levels d^* and structure similarity μ^* are presented in the charts above respectively.

In the analysed period there were important changes within the insurance sector. The presented calculations on the basis of comparison of similarity measures in the years 2000-2010 in the insurance sector indicate a definite improvement in the life insurance subsector in 2005 and its stabilisation since then. As far as the health and financial subsectors are concerned, the period 2000-2010 is characterised by a constant improvement of the structure features (close to the benchmark). In the case of catastrophe insurance the applied measures reflect the occurrence of natural catastrophic phenomena.

The second stage of research makes a comparison of the development insurance subsectors. Like in the case of the comparison of the whole sector at the first stage the correlations between features were examined. Next, the calculation of the structure similarity measure and differentiation of feature levels was conducted. The results are graphically presented in radar graphs (refer to Supplementary Figures) to the present article.

The analysis of subsectors indicates that within the subsector of catastrophe insurance, there is a dangerous phenomenon of negligence of preventive actions connected with the implementation of the risk of flood (diagnostic features in group 3 concern this risk). Besides, the sensitivity of the applied measures to the weather factors should be pointed to (group 1). In the sector of life insurance there was a considerable increase in economic features (group 1). There was a change in the significance of financial and social features in the analysed period. In 2005 group 3, i.e. social features, approached the benchmark the closest. Financial features also became more important. However, already in 2010 the significance of these groups decreased. In the sector of health insurance there is a perceptible rise in activity of households (group 2) and decline in the significance of the state policy (group 1). The signals of the activeness of the market in this sector are weak. Within the sector of financial insurance the biggest changes occurred in the group 3 (microeconomic features) and group 2 (operations of insurance companies and banks).

IV. CONCLUSIONS

In many literature titles the problems of risk management are considerably simplified or oversimplified through an inaccurate translation of the phrase of Risk Management. In numerous works the dominating perception of this notion is "zarządzanie ryzykiem", i.e. risk management in the literal meaning. As a result, complex problems derived from the disciplines of the Management Science and the Risk Theory have been grossly limited; instead, due to the needs of the financial market sectors, the problems of risk itself are being consistently developed. The management instruments so important for the effectiveness of the Risk Management procedure have been pushed into the background. This complicated procedure requires a comprehensive approach combining the problems of risk with efficiency and effectiveness of the instruments applied in the course of implementation of the aforementioned functions of management. Only the joint consideration of the process of risk together with distinguishing such categories as: *the subject of risk, risk implementation, probability of risk implementation or risk implementation effects*, which occur as the components of the risk process with the management instruments and tools allows for the full comprehension of the idea and goals of this procedure. The main goal of risk management is the improved effectiveness of the entity's operation through an appropriate reaction to the risk connected the entity's activity. The example to be quoted may be innovation activities, where the management of knowledge, cost and the whole process in the conditions of risk should be coherent and mutually complementary. Innovative companies should be supported by the insurance sector. They should also apply knowledge and appropriately analyse and allocate costs within the algorithms of behaviour compliant with the risk management. However, the examination of the sector shows that the insurance market in Poland in the analysed period was not innovative and it did not create innovation supporting services (and it is where the insurance risk appears due to the financial aspects of innovation). Simultaneously, insurance did not encourage investment in research and development. An essential function of insurance, as a specific financial market sector, is to encourage economic growth through the redistribution of gathered capitals. Insurance as one of the basic financial tools of the Risk Management procedure should play an important role in the process of development of innovation and as a consequence

the economic growth. The findings show that the insurance sector has not been innovative, in particular it has not created innovative services. It seems that insurance companies are not really interested in innovative activities. The new services should be created in such a way as to support innovative activities of other market players especially SMEs. Business companies could actively implement risk management strategies to handle risks related to their innovative activity through the application of innovative insurance services.

SUPPLEMENTARY MATERIALS

The supplementary materials can be downloaded from the journal website along with the article.

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