



POLISH ACADEMY OF SCIENCES

Systems Research Institute

**DEVELOPMENT OF METHODS
AND TECHNOLOGIES
OF INFORMATICS
FOR PROCESS MODELING
AND MANAGEMENT**

Editors:

**Jan Studzinski
Olgierd Hryniewicz**



**DEVELOPMENT OF METHODS AND
TECHNOLOGIES OF INFORMATICS
FOR PROCESS MODELING
AND MANAGEMENT**

Polish Academy of Sciences • Systems Research Institute

Series: SYSTEMS RESEARCH

Vol. 50

Series Editor:

Prof. Jakub Gutenbaum

Warsaw 2006

**DEVELOPMENT OF METHODS
AND TECHNOLOGIES OF INFORMATICS
FOR PROCESS MODELING
AND MANAGEMENT**

Editors:

**Jan Studzinski
Olgierd Hryniewicz**

This publication was supported by Polish Ministry of Science and Higher Education

This book consists of papers describing applications of informatics in process modeling and management and in environmental engineering. Problems presented in the papers concern development of methods supporting process management, development of calculation methods for process modeling and development of technologies of informatics for solving some problems of environmental engineering. In several papers results of the research projects supported by the Polish Ministry of Science and Higher Education are presented.

Paper Reviewers:

Prof. Olgierd Hryniewicz

Dr. Jan Studzinski

Text Editor: Anna Gostynska

Copyright © Systems Research Institute of Polish Academy of Science,
Warsaw 2006

Systems Research Institute of Polish Academy of Science
Newelska 6, PL 01-447 Warsaw

Section of Scientific Information and Publications
e-mail: biblioteka@ibspan.waw.pl

ISBN 83-894-7507-3

9788389475077

ISSN 0208-8029

CHAPTER 1

Process management and management tools



MANAGEMENT BY THE RISK AS THE PRESENT CONCEPTION OF THE MANAGEMENT OF THE ENTERPRISE*

Jadwiga BIZON-GÓRECKA

Faculty of Civil and Environmental Engineering
University of Technology and Agriculture in Bydgoszcz
<bizon@atr.bydgoszcz.pl>

Abstract: *The present article relates to the results of conducted investigation in the range of the current paradigms of the management of the enterprise with the regard of the risk. Holistic investigation of the problems of risk in the organization brought to create the new approach to the management of the organization: the management by the risk. The basic axioms of this conception and the principal stages of the management by the risk were presented. Besides there were also shown its relationships with the management of the risk in the organization. The management of the risk at the organization was described as a safety assurance tool.*

Keywords: Risk, enterprise, management.

1. Introduction

The risk is the invisible phenomenon which requires the serious treatment. (the motto of the paper Bizon-Górecka, 2001). Managers of all grades of the management struggle with the problems of the risk. This is the explanation of the system approach to management of the risk, what the author signaled earlier already (Bizon-Górecka, 2002). The interest in the phenomena of the risk leads to the creation of the present conception of the enterprise management which is the management by the risk. Coordinated managerial activities with the compliance of the risk can be called as the *management by the risk*.

The idea of *management of the risk* includes all the activities to identify, estimate and treat the risk; it means its reduction, diversification, as well as the utilization of the phenomenon of the risk. Nowadays, great interest in risk phenomenon is observed that changes into applying good practices in the economic subject management and it helps in achieving aims.

* The article was worked out within the of the investigative project MNiI no. 1 H02D 033 27: Modelling the structure of the system of the management the risk in the enterprise - the holistic formulation.

The risk in the enterprise is connected with the incomplete predictability of the future conditions of its functioning. It results from the fact of discontinuity of phenomena that take place both in processes inside the organization as well as outside. Historical data becomes out-of-date and become insufficient to construct full information about the future. However, all the ways of an expectation use experiences from the past and that's why they are burdened by the risk. The problems of the risk can be considered from the point of view of stakeholders. The risk of functioning the organization refers to them. We can talk about consumer's risk, enterprise owner's risk, workers' risk and also the risk of people from the surroundings of the organization - the supplier of productive goods (delivering materials, semi-manufactured articles, financial capital, etc.) and occupants living in the close and far organization environment. Text mentioned above evidences about a major role of management of risk in the structure of management of the enterprise.

2. The risk management in the organization

The management of the risk means the management of current activities with the thoughts about tomorrow. According to P.F. Drucker (1995): "during the stormy times managers can't presuppose that tomorrow will be the prolongation of today. Just the opposite, they have to manage with the thought about changes; the changes as the chance and as the threat." He also claims, that „managers have to more and more strongly underline the responsibility for earning on the costs of the risk...”.

The risk in the economic system depends on many varied factors, which in every enterprise have to be defined and considered. These factors can be divided into three groups:

1. the factors of the external situation of the enterprise, e.g.: the factors of supply and sale, the accessible technologies of the production, competition, buyer requirements;
2. the factors of the internal situation of the enterprise, e.g.: the strategy of the enterprise, the structure of the production, organizational structure, the size of the enterprise;
3. specific factors connected with the realization of definite projects, e.g.: the necessary time to initiate, temporariness, an influence on the environment.

In planning the activities with the high degree of reliability, the attempts of improvement of the ways of identification and the estimation of the risk in the enterprise are undertaken. Identification and the opinion of the risk in the enterprise are important stages of the management of the risk at the enterprise (Enterprise Risk Management).

Specifying the context of investigation of the problems of the risk is the datum-point to the identification of risks. It is necessary to define the strategy of the organization, internal conditions of its realization and the general conception of the management of the risk (inter alia: level, range, aim).

The identification of the risk has to be based on the documentation of conditions and circumstances that relates to the threats of the aims' achievement of strategic and operating organizations or to present the areas, in which it is possible to get some advantages on the competitive market. The pattern of the specification of the risk in the economic system is presented in the paper Bizon-Górecka, (1998), represents Figure 1.

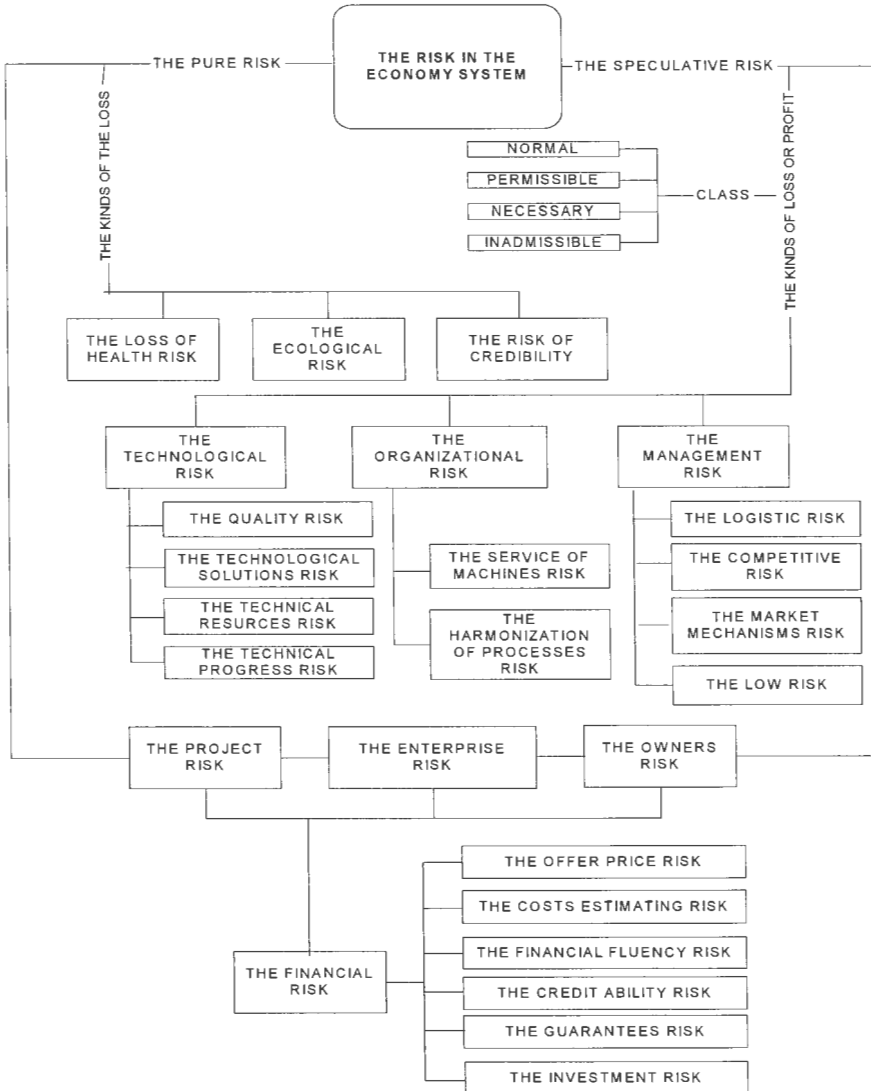


Figure1: The scheme of the specification of the risk in the economic system. Source: Own study

The essential matter is to find the relations between the risks identified in the economic system with the risks classification:

- the risk of surroundings - resulting from the external situation of the enterprise:
 - the risk of far surroundings - risks appearing in the macroeconomic scale on the level of the country and global level (also the political risk),
 - the risk of purposeful surroundings - including the local situation of the enterprise and problems, resulting from the branch specifics in which it operates;
- the risk of internal processes - resulting from the changes of the internal situation of the enterprise,
- the specific risks - resulting from changes of functioning the organization specifics.

In order to identify the risk at the enterprise it is necessary to realize the places of the organization safety threats formation - both its subjective as well as objective side. The mapping of risks, consisting on the risk of a functioning the enterprise, it has to be based on the analysis of its organizational structure and led activity, which is classified (according to Polish Standards Accountancy) the most generally as:

- operating activity, basic kind of the activity of the unit (productive, trade, service) and different kinds of the activity, not ranking to the investment or financial activity;
- the investment activity (locational) which the subject is purchase or the sale of material fixed assets (fixed assets, fixed assets under construction), immaterial and legal values, long-term investments and short-term financial assets (with the except of money and their equivalents) and connected with this money costs and advantages, with except of relating to the income taxes;
- the financial activity, which subject is beyond-operating getting the sources of funding or paying off them, as well as connected with this money costs and advantages, with except of those that relate to the income tax.

One generally - from the point of view of the areas of the activity – it can be defined: *the operating risk*, connected with undertaking activities of the operating character, *strategic risk*, engaging investing in the future of the organization (also identified as the investment risk) and *financial risk*, connected with the applied prices of products (rate of interest, monetary, etc.), fluency (cash flows, expectation of costs, etc.), or the credits (e.g. the regulation of the obligations). They treat to phenomena and activities (or their renunciation) in the individual ranges of the activity.

You should also consider the risk on the next levels of functioning the organization - the level of *the organizational system*, the level of individual *processes*, the level of *positions*.

The source of the risk - both the *subjective* side, and also *objective* - they can be the result of functioning *internal processes*, and also they can come from *the surroundings of the organization* and shaping its *strategy*, causing a *strategic risk*. The various sources of the risk of the functioning the organization, they affect on it with the various ways of the risk. These ways are getting into many tangles from what the phenomenon of the interference of risks coming off.

You should simultaneously perceive functioning the enterprise in the dynamic formulation which means the necessity of investigation of the phenomena of the risk in the function of the time $R(t)$. The dynamics of the changes of the image of risks is the measure of the sensibility of the organization on the changeability of conditions and the circumstances of its functioning, making up the background (context) of the risk.

The estimation of the risk consist of an estimation of the probability of the pronouncement of threats from the title of independent factors from the people of the organization, and also dependent on them, affecting on not achieving the aims on the level of position, processes and whole organization. D.A. Rummler and A.P. Brache, (2000) wrote about a need of cohesion of aims on these three levels.

The management of the risk, as the art of making rational decisions, runs in following (basic) stages by standards:

1. identification of the risk,
2. estimation the risk,
3. steers the risk,
4. funds the risks,
5. control of undertaken activities.

The identification of the risk:

The identification of the risk depends on the qualification, what the kinds of the risk and the enterprise is threatened in what range. The analysis of individual processes necessary is from the point of view of their threat the risk here, and then their classification. They also are subject to the detailed analysis external events, which threaten the enterprise from outside and the ones who they can come into being on the enterprise area and threaten different.

Estimation of the risk:

Estimation of the risk consists of the qualification of the possibility of the rise of damage (probability and the size of the loss). The conducted correctly opinion of the risk allows to undertake some activity to reduce the degree of risk of the enterprise on the loss of his assets.

The steering the risk:

Basic aim of steering the risk is the qualification of the prevention centers that eliminate or restrict the estimated risk. The choice of the suitable centers is the result of the detailed analysis of effectiveness and the costs of their introduction each time. The costs of the limitation of the risk cannot be higher than the cost of damage which can occur (damage in the material and immaterial meaning). Steering the risk consists of undertaking activities restrictive to the risk to put admissible sizes. Limiting the risk stands up in the contradiction with the remaining aims of the activity of the enterprise often, in this first of all with achieving desirable rentability and for fluency. Economic organizations usually aim to the maximization of the profit.

A rising profit is often possible through enlarging the sizes of the risk. Risky undertakings are often connected with large earnings. However, above a certain level the risk of the loss can threaten the achievement of the profit. The improvement of rentability stays in the contradiction with a fluency. The limiting risk is also connected with having additional costs. The qualification of the sizes of the admissible risk is necessary.

Two kinds of activities can be undertaken in steering the risk:

- the activities influencing on the causes of the occurrence of the risk that limit the risk - they are defined as the active strategy of the counteraction of the risk,
- the activities influencing on the results that decrease the negative influence of unexpected losses on the position of the organization, consisting of enlarging the capital, reserves - they are defined as the passive strategy of the counteraction the risk.

The enterprise avoids the risks through avoidance of risky undertakings, the qualification of the limits of commitment in the face of individual projects.

Funding the risk:

All risks, which are not eliminated for the help of the prevention tools, have to be funded. The basic forms of funding the risk are:

- maintenance of the risk on the own part:
 - without applying the means of prevention,
 - with the use of the means of prevention;
- transfer of the risk on different subjects (e.g. tradesmen, buyers, subcontractors, insurance companies):
 - total,
 - partial (with franchising, the limit of the responsibility, the exclusion of an object and the range of insurance etc.).

The control of undertaken activities

The aim of control of the undertaken activities is examination of the efficiency of activities aiming to limiting the risk. The procedures of internal controls play a large role in control and limiting the risk.

The rationally conducted process of the management of the risk allows to find optimum solutions, being the compromise among insurance and leaving the risk on the own part. This compromise makes up the insurance programme. The management of the risk is also a professional approach to insurance.

One can observe the co-occurrence of the stages of activities in the range of the management by the risk at organization and management the risk near what this last helps decision processes in the management.

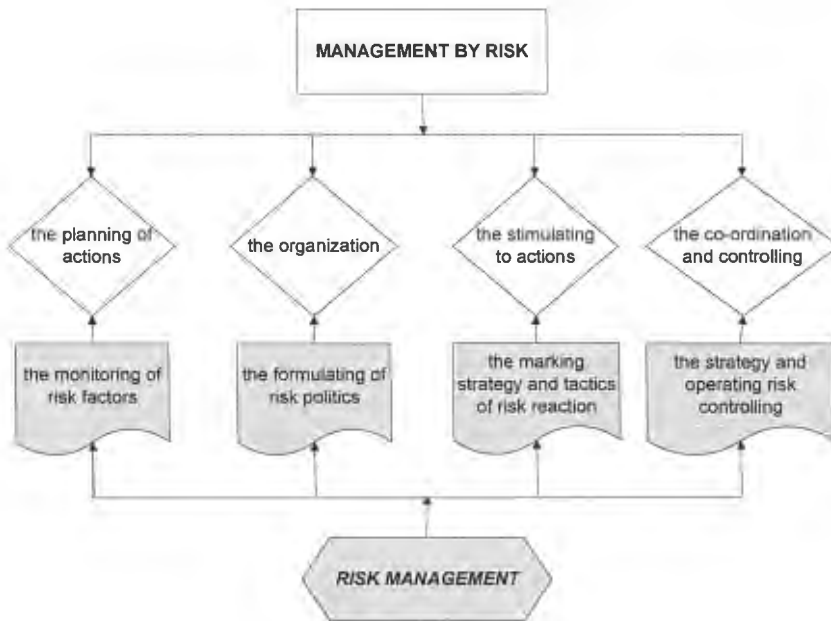


Figure 2. The scheme of the relationship: management by the risk and risk management.

Source: The own study

And so:

- in the planning of the activities it can be used information coming from the monitoring of the factors of the risk in the planning of the activities,
- organization of the activities should take into consideration the elements of the politics of the risk in the enterprise,

- stimulating the workers activity should be realized on the background of formulated strategies and the tactician of the reaction on the risk,
- coordinating and controlling the processes of the management can use strategic and operating controlling, making up the tool of the risk management.

Dependencies mentioned above describes Figure 2.

The management of the risk makes up rational steering the elements of the risk having on the aim of avoidance or limitation of financial results of random events, such as e.g. the standstill in the production, material damage, the loss of the positive view of the company.

3. The risk management and the safety of the organization

A state of the safety of the organization (O) in the moment t (S_t^o), exposed on occurrence of many risks (R_i), behaving in the dynamic way (dependent on the time t), describes a set of the states of the safety letting describes the elements e to distinguish (positions, processes) of the organization:

$$S_t^o = \{ S_{t,R_i}^e : e \in O, t \in T, R_i \in R^e \} \quad (1)$$

The states of the safety of the organization, or particular elements expressed in the figure of probabilities of the fulfillment of requirements (the achieving put aims). Therefore the degree of the achievement of aims is the measure of the reliability of functioning position, process and whole organization (\bar{R}). At the other hand risk (R), in the sense of the probability, marking the degree not the achievement of put aims, it stays with reliability in the relation:

$$R = 1 - \bar{R} \quad (2)$$

Production systems, as reliably structures of the sets of engineering subsystems (biotechnological) and the subsystems of management functions require simultaneous capturing the questions of the reliability of biotechnological systems (ipso facto risks of functioning) and the questions of the risk of led activity (ipso facto reliabilities of the action).

The settlement of the gathering of the measures qualification of the level indispensable reliabilities of the achievement of the aim on the given level (position, process, organization) in the moment $t \in T$. At the whole organization, the set of values M_t^{ao} present values for individual elements:

$$\{ M_t^{ao} = M_t^{a,e} : e \in O, t \in T \} \quad (3)$$

It is worth to notice if there is a continuity of stands' aims integration, processes and whole enterprise. The organizational order can reflect the map of the re-

port of processes (relatively also the positions). Preparing such map leads to the reflection of the reliability structure of the organization. Utilization of the principles of the theory of reliability allows us to construct organizational structures of the high degree of reliability (the possibility of building unailing structures from untrustworthy elements). Therefore you, because of dependence described the formula 2, should notice that the theory of reliability can make up the perfect tool of the risk management in the enterprise. You should also notice that besides the probability of unfavorable situations, their results are also important, definite according to received measures.

The value of the risk $VaR(t)$ portrays the sizes of the risk, counted as the product of the probability of the risk $R_i(t)$ and value subject on the risk Va_i . You should notice that every action implies risks in many areas. The total value of the risk is the sum of products probability of the risk in the given area „i” ($R_i(t)$) and value at risk in this area (Va_i):

$$VaR(t) = \sum_1^n R_i(t) \cdot Va_i \quad (4)$$

4. Basic axioms and the procedure of the management by risk

Appearing theory of the management by the risk has the chance to happen the universal conception of the management of the organizations. One can specify the basic axioms of this theory as follows:

- The axiom 1: the risk treats to the future (the future conditions of the man actions, if functioning different objects);
- The axiom 2: one associates the risk with the failure of expectations;
- The axiom 3: estimates the risk this defining *a priori* of deviations between expectations and the actual materialization of events;
- The axiom 4: the whole row of risks named accompanies actions undertaken at the organization, then there are risks caused named random events and the unnamed risks whose character is unknown in the moment of making the decision;
- The axiom 5: the probability of the pertinence of expectations makes up one from the measures of the risk;
- The axiom 6: the palette of risks steps out at every organization, letting to mapping according to processes in her setting;
- The axiom 7: various risks at organization and every its element can step out in the independent form or be subject to the phenomenon of interference;
- The axiom 8: is the point of exit to the identification of risks specifies the background and context situational investigation of the problems of the risk, and in the peculiarity of subjects undertaking the risk;

- The axiom 9: in the theory of the management by the risk, hugging a planning, organization, the stimulating to actions the coordination and controlling the prominent place occupies the management the risk, understands as monitors the factors of the risk, formulates the politics of the risk, laying out strategy and the tactics of the reaction on risk, strategic and operating controlling;
- The axiom 10: for the organization particularly essential there is the value subject on the risk;
- The axiom 11: the quota of the risk serves the safeties of the organization to the assurance, the understood as buffering, of the supplies on the circumstance of the fulfillment oneself foreseen risky situations.

The management by the risk procedure owing to hug in the enterprise following stages:

- I. The preliminary qualification of the key areas of the risk;
- II. The qualification of situations in surroundings causing threats;
- III. The location of the places of formation of the threats in individual internal processes;
- IV. The creation of the descriptions of threats connected with the pronouncement of random events;
- V. The qualification of the map of risks;
- VI. Construction of the map of processes in the enterprise, as the painting of the reliability structure;
- VII. The creation of the gathering of the measures of the achievement of the aim of processes;
- VIII. Creation the gathering the data describe the probability of the pronouncement of random events, leading to the pronouncement of damage;
- IX. Estimation of maximum possible damage;
- X. The opinion of the direct and indirect results of the risk;
- XI. Delimitation of the admissible values of the risk level (acceptable by the organization);
- XII. The building of the complex programme for the undertaking of the risks; avoidance, reduction, retention and transfer;
- XIII. The variant proposals of the possible programmes for the protection of the safety of the organization;
- XIV. The qualification of the risk quota as the compensation of the foreseen loss on various organizational levels - in the figure of chosen supplies.

5. Conclusions

To sum it up it has to be said that improvement of the organization is a continuous search of the new organizational order. Current searches in this range concentrate around the questions of the risk connected with functioning the organization. The management by the risk is treated as the source of the competitive superiority of enterprises outright. The omnipresent risk should be perceived by economic individuals as the chance for these, which will approach to it in the pragmatic way, they will undertake the trouble of the sensible game with the risk, the aim of decrease of his negative results and assuring the economic success of their organization they will distinguish themselves from the competitors.

At the enterprises, taking into consideration the problems of the risk can be seen in the crossing from the classic target function (the maximization of the profit) to the target function, which takes into account the risk of the bankruptcy of the enterprise which is the minimization of the probability of the bankruptcy.

References

- Bizon-Górecka J. (1998) *Methodology of the Risk Management in the Building Production*. University of Technology and Agriculture, Bydgoszcz.
- Bizon-Górecka J. (2001) *The Engineering of Reliability and Risks in the Management of the Enterprise*. OPO, Bydgoszcz.
- Bizon-Górecka J. (2002) The risk management system as panacea on the risk of the management the organization. *The Review Organization*, 9: 33-35.
- Drucker P.F. (1995) *Management in Stormy Times*. University of Economy in Krakow, Kraków.
- Rummler G.A., Brache A.P. (2000) *Lifting of the Organization Efficiency*. PWE, Warszawa.

Jan Studzinski, Olgierd Hryniewicz (Editors)

**DEVELOPMENT OF METHODS AND TECHNOLOGIES
OF INFORMATICS FOR PROCESS MODELING
AND MANAGEMENT**

The purpose of this publication is to popularize application of informatics in process modeling and management and in environmental engineering. The papers published are thematically selected from the works presented during the conference '*Multi-accessible Computer Systems*' organized by the Systems Research Institute and the University of Technology and Agriculture in Bydgoszcz for several years already in Ciechocinek. Problems presented in the papers concern: development of quality and quantity methods supporting the process management, development of quantity methods for process modeling and simulation, development of technologies of informatics for solving problems of environmental engineering. In several papers results of research projects supported by the Polish Ministry of Science and Higher Education are presented.

ISBN 83-894-7507-3

9788389475077

ISSN 0208-8029
