

MODELS OF ENTERPRISE RISK management

Petr Stodola¹, Jiří Stodola²

ABSTRACT

The article deals with the task of enterprise management unsuccessful risk models and provides logic-probability risk models; management unsuccessful in function; management of the enterprise as a complex object; unsuccessful enterprise in the direction of its activities; the development logic-probability risk models enhance the management efficiency.

Key words:

Management, models, enterprise, risk, efficiency

1 INTRODUCTION

The present and future manager should be capable of many new tasks: to calculate all the risks, to manage proceeding from the set objectives, to take strategic decisions, to create the team, to choose the most justified risk opinion, to perform several other functions, to know the enterprise products, coordinate the products, to provide information, etc. The up-to-date manager can cope with all this provided there is some summing up of the managerial experience describing facts, situation, rules, and risk assessment procedures for all the decision making aspects. The results of analyzing works on the strategic management, however, have revealed that there are no mathematical methods or models of risk-based management, that common sense is not transformed to the unsuccessful risk logics and model, that no scenario-based management is used, that management strategies are considered separately rather than on the whole, there are no enterprise unsuccessful risk models. Works by foreign authors describe many examples and cases of managerial decision making. Some of this materials are precedents provided by the word enterprises and companies, for example GM, IBM, GE, VW, etc. This examples describe successful and un successful fragments of the enterprise strategic management, mathematic models, management

¹ Petr Stodola, Ing., Ph.D., University of Defence Brno, Faculty of Economy and Management, Kounicova Str. 65, 662 10 Brno, Czech Republic. Tel. +420 973 442 474 E-mail: petr.stodola@unob.cz

² Jiří Stodola, prof. Ing., DrSc., A. Dubcek University of Trencin, Faculty of Special Technology, Studentska Str. 1, 911 50 Trencín, Slovak Republic. Tel: +420 973 442 278 E-mail: jiri.stodola@unob.cz

process, etc. Summarizing of the management experience in the description of facts, roles and cases is needed, primarily for managers are in Figure 1.

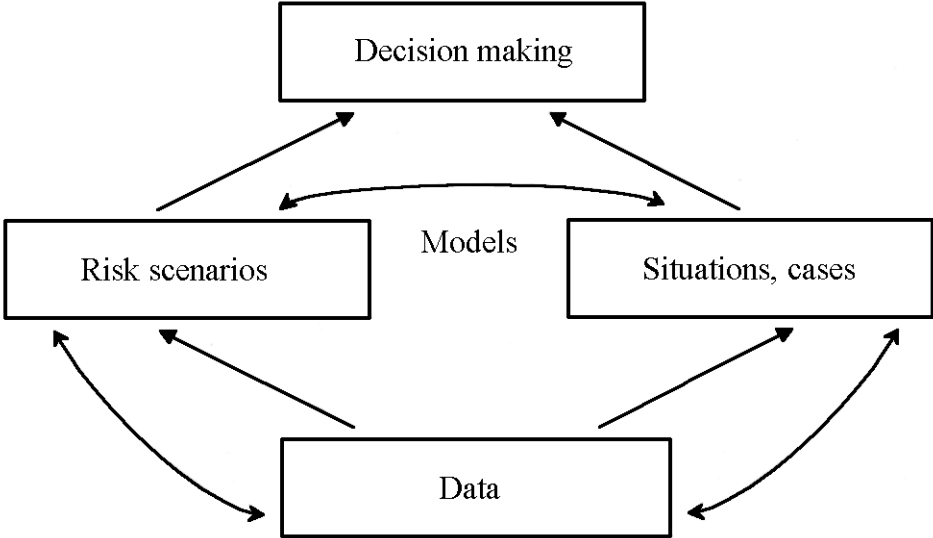


Figure 1 Models, data and decision making in company management

2 logic-probability risk theory

There can not be strategic enterprise management without the management risk quantitative assessment analysis. The main achievements in the risk assessment and analysis are featured by the logic-probability theory. This theory is attractiveness is in its clearness and unambiguous quantitative risk assessment, extensive capabilities in analyzing the effect of any element, including the personnel, on the entire system security. The risk model may have AND, NOT, OR, NAND, NOR, MAJ and XOR logical links between the elements, system, and cycles. The risk dynamic are taken into account probabilities in the course of time. The logic-probability theory in the systems with incompatible groups of events enables risk to be modeled and analyzed in the systems whose elements have several states, and this risk models to be constructed for economical and organizational systems. Structural model in functions of the management risk is in Figure 2.

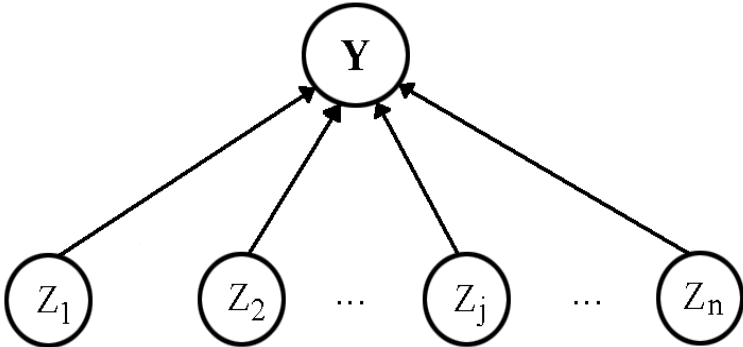


Figure 2 Structural model of the management risk in functions

The scenario of enterprise management unsuccessful risk consist of the functions: strategic planning, accounting, marketing, personnel management etc. All functions are designed by logical variables. Independent binary variables for the unsuccessfulness events in management functions assume the values of 1 or 0 with the following probabilities

$$P\{Z_1 = 1\} = P_1, \dots, P\{Z_n = 1\} = P_n \quad P\{Z_1 = 0\} = 1 - P_1 = Q_1, \dots, P\{Z_n = 0\} = 1 - P_n = Q_n. \quad (1)$$

Logical management unsuccessful risk function

$$Y = Z_1 \vee Z_2 \vee \dots \vee Z_j \vee \dots \vee Z_n. \quad (2)$$

Logical function in the equivalent form after its orthogonalisation

$$Y = Z_1 \vee Z_2 \bar{Z}_1 \vee Z_3 \bar{Z}_2 \bar{Z}_1 \vee \dots. \quad (3)$$

Orthogonalisation means that the logical product of any two summands in equation (3) is equal to 0. For a simple logical function (2), orthogonalisation procedure is easy and obvious. For complex logical function with *AND*, *NOT*, *OR* variables links and cycles, the orthogonalisation procedure can not be performed without use of a PC and software facilities. After the orthogonalisation of logical function equation (3), from the logical description of the risk, we will pass to the arithmetic description. Probability model of the management unsuccessful risk

$$P = P_1 + P_2 Q_1 + P_3 Q_1 Q_2 + \dots. \quad (4)$$

Aritmetics in this model of the risk is such that for the final event, the amount of the risk is within $[0, 1]$ with any values of the initiating event probabilities. Probabilities of the management in functions can be determined by the expert assessment.

3 Quality Model of Loss risk in company operation

The quality management of the entire company operation consist of finances, personnel, resources, etc. The quality model criteria are divided into two categories: *possibilities* and *results*. Possibilities category Z_{10} is determined from the criteria assessment: role of the management in organization of works Z_1 , use of employees potential Z_2 , planning and strategy in the sphere of quality Z_3 , use of resources Z_4 is determined from the assessment of satisfaction criteria of the interested parties: employees Z_6 , consumers Z_7 , society on the whole Z_8 and financiers Z_9 . The self Quality of the company assessment is made by the company. The company assesses each criterion $Z_1 - Z_9$ in points and calculates this ratio of assessment to the maximum possible value from the standard. The system of participation in quality competitions allows the criteria level to be assessed in percent of the maximum possible value. As

this is done, the degree shortcoming of the company in each criterion and each direction of operation can be objectively seen. Achievements of the company are determined by comparing the criteria numeric $Z_1 - Z_9$, year after year. Modernizing of the company function quality model has been proposed. It consist of replacing the arithmetic addition of criterion events with logical addition of criteria probabilities. For the structural, logic and probability model of the risk of losing the company functioning quality, random events are designated by the some logical variables $Z_1 - Z_9$. Quality of the logical Y variable and derivative *possibilities* and *results* are Z_{10} and Z_{11} respectively. The structural model of the quality loss risk with OR logical links is provided in Figure 3.

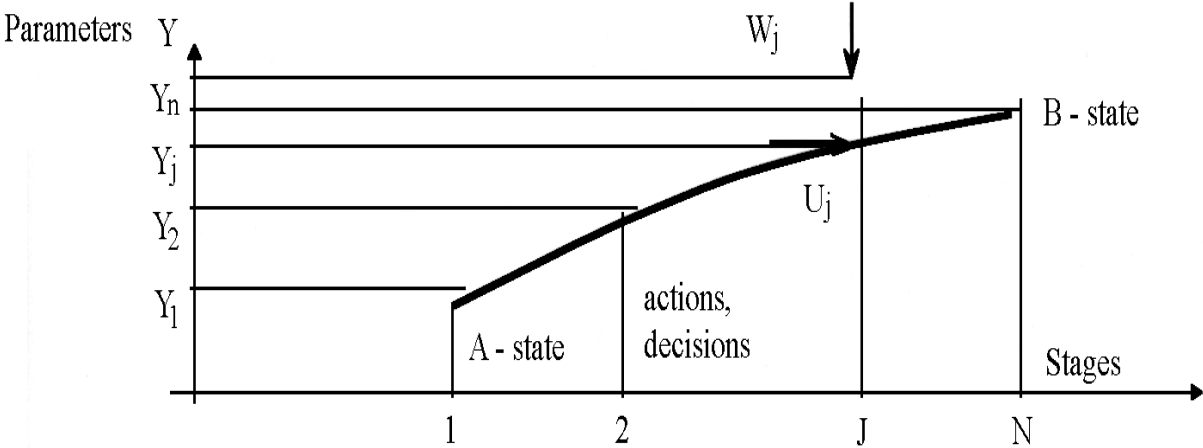


Figure 3 Structural model of company quality loss risk

Logical function risk in a disjunctive normal form

$$Y = Z_1 \vee Z_2 \vee Z_3 \vee Z_4 \vee Z_5 \vee Z_6 \vee Z_7 \vee Z_8 \vee Z_9. \tag{5}$$

Logical function of risk in orthogonal disjunctive normal form

$$Y = Z_1 \vee Z_2 \bar{Z}_1 \vee Z_3 \bar{Z}_2 \bar{Z}_1 \vee Z_4 \bar{Z}_3 \bar{Z}_2 \bar{Z}_1 \vee \dots. \tag{6}$$

Polynomial function of risk form

$$P\{Y = 1\} = P_1 + P_2 Q_1 + P_3 Q_1 Q_2 + P_4 Q_1 Q_2 Q_3 \dots. \tag{7}$$

In the research, values of the probability loss risk criterion (7) and mean geometric probability have been calculated. Company functioning quality criteria is usually grooving from year to year, but this growth is different for different criteria. The logical quality criterion is more accurate and transparent.

4 MANAGEMENT of company as complex system

The company development is regarded as the management of the company state, see Figure 4, in the direction from the initial state A to the set final state B along the chosen program track $A - B$ and with a correction of the company state in the case of deviation from the track. Such interpretation of the company management objective uses the following notions: $H(1,2,\dots,N)$ are development stages or years; $Y(Z_1, Z_2, \dots, Z_m)$ are monitored parameters or strategic objectives or their risks; $U(U_1, U_2, \dots, U_n)$ are control actions or strategic decisions; $W(W_1, W_2, \dots, W_n)$ are corrective actions to return the company state to the program track it has deviated from it.

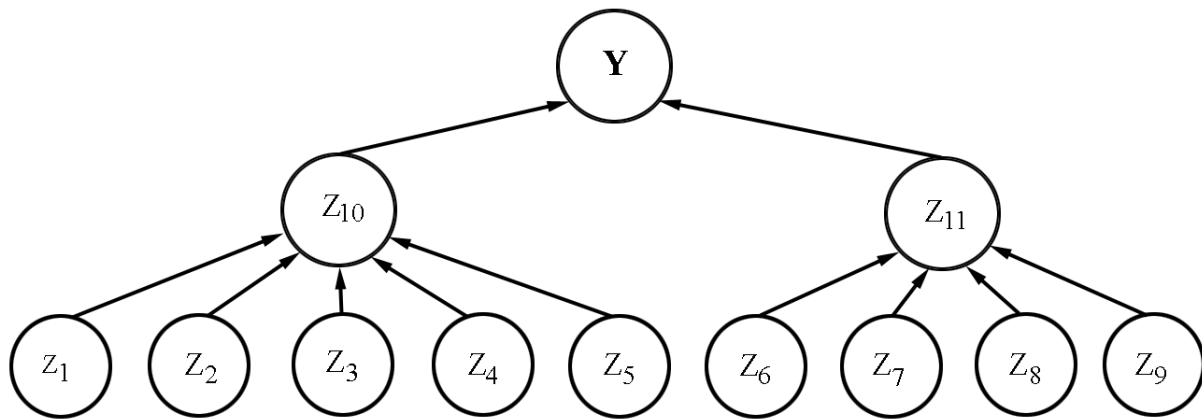


Figure 4. Management of the company as a complex system

The company management and manager training technology can be shown in the form of the following logically closed series of the cognition pattern procedures:

1. Forecasting of the company unsuccessful caused by Y parameters, i.e., exit of the parameters beyond the admissible value corridor;
2. Processing of information in the course of functioning and making a decision on the selection of W correction;
3. Modeling or distribution of resources for monitoring parameters Y , control U and corrective W actions;
4. Elaboration of development program, values of monitored parameters Y , control U and corrective W action at H stages included;
5. refinement of models to determine values of Y , U , W parameters, resources for the interpretation of Y , U , W parameters and losses in the case of failure to implement these parameters.

5 Conclusions

The main results of the consideration and work are: the following logic probability risk models have been developed (management unsuccessful in functions as a complex

object; company unsuccessful in direction of activities and in accomplishing an objective or a group of objectives; loss of the company functioning quality etc.). Logic probability models of the risk management can be used for the control of the company by risk criterion. The development logic probability risk models improve efficiency of the strategic management.

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Článok recenzoval:
doc. Mgr. RSDr. Vladimír Míka PhD.