RISK MANAGEMENT IN THE PLANNING OF DEVELOPMENT PROJECTS IN THE INDUSTRIAL ENTERPRISES

The article presents risk management model in the planning of development projects of industrial enterprises, operating in the metallurgy and mining. The model enclosed methods of identiĀcation, measurement and evaluation of risk. The model was created as a result of several years of research of the problems of planning and evaluation of the effectiveness and risks of the development projects implementation in industrial companies.

Key words: industry, enterprise, development projects, identiĀcation, measurement and risk evaluation

INTRODUCTION

Metallurgy and mining are very important, traditional industries in Poland. For many years, industrial enterprises in these sectors have under gone changes toward improving operational effi ciency and value increase. Achieving this goal requires an implementation of development projects, which benefi t these companies, as well as the general economy and bring social benefits.

Planning development projects is a complex process which requires multi-faced analysis, which should provide suffi cient information allowing making the decision whether or not to implement a particular project. These decisions are the most diffi cult among all economic decisions. The achievement of planned benefi ts depends on the future unknown conditions of enterprise operations, determined by internal and external factors. These factors are often in mutual dependency , particularly diffi cult due to the industries of metallur gy and mining, which is characterized by the complexity of the production process and the variety of technical and technological solutions.

So far, there are not known methods enabling accurate identification of future conditions under which such metallurgy and mining enterprises will operate. It has created a risk of non-execution of the objectives that have been adopted by the company and which were the basis for making decisions about the implementation of specific development projects. That danger associated is with a possibility of not receiving scheduled benefits or incurring unintended losses can be defi ned as a risk [1, 2]. Risk must be managed to achieve the expected benefits while losses are consciously controlled. The purpose of this article is to provide risk-management model that can be used in the planning of industrial development projects.

_____
J. Bijańska, K. Wodarski, Silesian University of Technology, Department of Organization and Management, Zabrze, Poland

RISK MANAGEMENT MODEL

Figure 1 presents the risk management model. The essence of this model is to integrate the planning of development projects and risk management, to allow mutual use of information provided. The process of planning of the development projects involves study of the development opportunities, pre-feasibility study and feasibility study [3]. As a part of the process particular stages of risk management are realized, which include: identification, measurement and evaluation of risk, and also development of actions against the risk [4].

In the study of the development opportunities, environmental analyses and the potential and strategic position of the enterprise are thought through.The purpose of these analyses is to examine the future conditions of the enterprise in the environment, diagnose the present and the future situation of the enterprise and the evaluation of its strategic position. The result of these analyses are informations presenting opportunities and risks, as well as strengths and weaknesses of the business fi rm. Based on the information, directions of growth the enterprise are determined and variants of the development projects are defined. These informations are also the base for the first stage of the risk management process. The purpose of this step is to identify the potential risk factors that could cause a failure to obtain the expected benefi ts and incur an unintended losses. In the model, which was prepared to identify risk factors the use of heuristic and statistical methods were adopted, based on expert judgment [3].

In pre-feasibility study , after verifying if the resources are achievable for the implementation of individual projects, the analyses and preliminary evaluation of these projects in the aspects of oganizational, technical, economic and fi nancial were carried out. Information obtained from these analyses are the basis for measuring and evaluating risk.

In a competitive economy the primary of tar get development projects is to achieve economic results.

Therefore, it is assumed that the risk of the development projects can be defined as the possibility of not achieving the expected level of economic effi ciency which is measured by net present value (NPV) [2, 5]. NPVresult

Figure 1 Risk management model in the planning of development project [3, 4]

depends on the values of the input parameters, which are technical and economical indicators. Input parameters remain in cause - effect relationship with individual risk factors. Accordingly, information about the evaluation of the parameters defining the NPV is at risk.

In the presented model to measure the risk of development projects used probabilistic simulation. It requires to determine ranges of variation of parameters controlling the level of NPV, which values will be predicted with certain probabilities. The consequences are the values of the input parameters, determined with a probability calculation. It is assumed that the variation, which are NPV probability calculation depends on the variability of each of the input parameters (random variables). NPV probability calculation is obtained by using Monte Carlo simulations [5 - 7]. The base of the simulation are cumulative probability calculations of each of the random variables, called uncertainty profiles. In the model, for each variable a value, based on an established uncertainty profi le is generated. Obtaining a set of values of individual variable completes the first simulation. Based on received values of random variables NPV is calculated. Number of required simulations depends on the expected accuracy [4]. Based on the results of the simulations which were made NPV distribution function is calculated. After that, the expected value of NPV (μ_{NPV}), the standard deviation of NPV (σ_{NPV}) [2] and the probability of loss (p) are calculated. The measurement results are the base of the risk evaluation. The risk evaluation is carried is based on a decision diagram, drawn in a Cartesian coordinate system (μ_{NPV}, σ_{NPV}). This diagram enables the classifi cation of the project in view of the probability of loss (p) to one of the three levels: I) "acceptable risk", II) "important risk – possible to accept", III) "unacceptable risk". If the risk is "acceptable" it is necessary to control the risk, to not exceed the level specified in the decision diagram. If the risk is "essential - acceptable" a further actions to reduce it or transfer it to third party, e.g. to insurance company should be taken. If the risk is "unacceptable", a decision not to continue the development project should be made.

Information obtained in the pre-feasibility study of the development projects are the base for the implementation of the feasibility study . It is based on a detailed analyses of all the terms of the future implementation of the project. The result of the analyses is to develop the final version of the project. As part of this study , it is necessary to re-measure and re-evaluate the risk, taking into account the specific information that affect the possibility of not achieving the expected level of economic efficiency. It is assumed that the measurement and evaluation of risk is made in the same way as in the pre-feasibility study.

DISCUSSION OF RESULTS

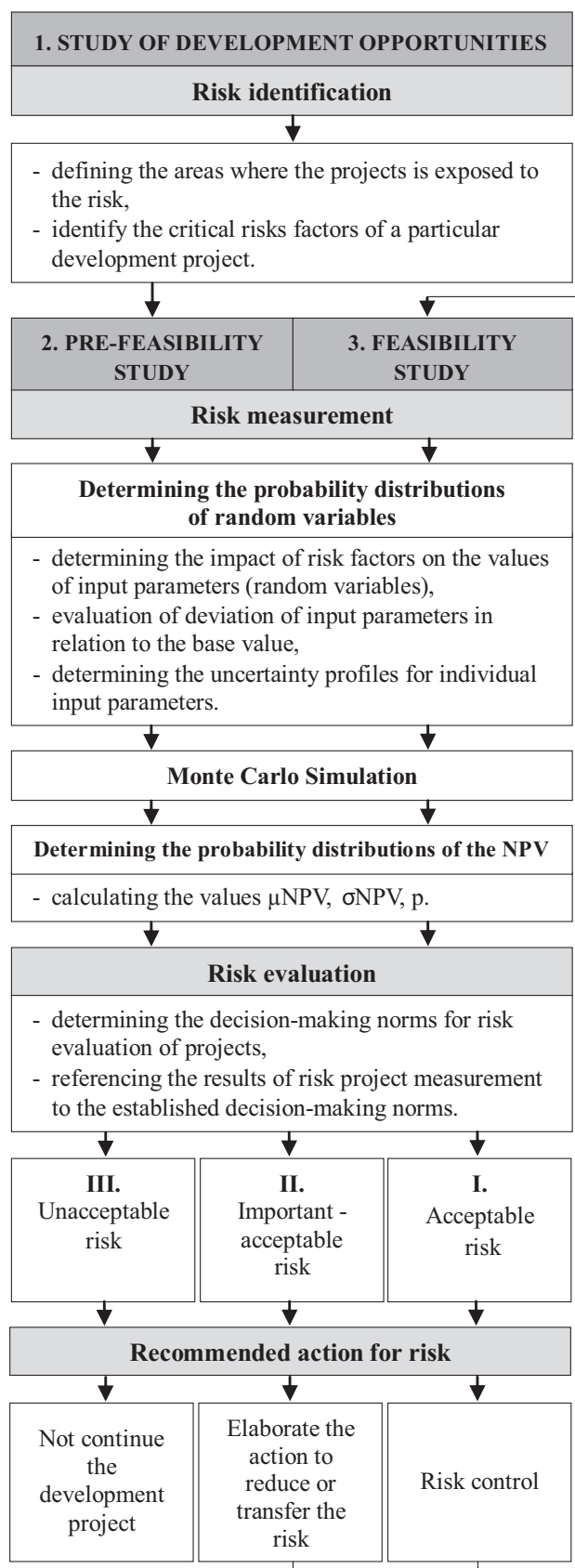Risk management model has been applied in the process of planning development project, which con-

cerned a production of a new manufacturing plant. The study of the development opportunities made it possible to identify the following critical risk factors: the size of financial expenses for the production plant build, the demand for produced products, selling prices of produced products, the cost of production, cost of capital, which finance the production plant build. Based on the information obtained in the pre-feasibility study , the following results of risk measurement: μ_{NPV} = 0,42 billion PLN, σ_{NPV} = 0,92 billion PLN, p = 0,34 were received. For the evaluation of the risk, the decision diagram was developed, in which risk levels correspond to the following probability values: (p): I) 0-0,1, II) 0,11-0,67, III) 0,67-1. Relating the risk measurement results to the accepted standards allowed for the risk evaluation, which indicated that the risk is significant, but it is possible to accept after the introduction of specific preventive actions. Risk measurement in the feasibility study of the project, after taking into account a number of technical and organizational measures, indicated the reduce of the risk: μ_{NPV} = 2,1 billiard PLN, σ_{NPV} = 1,2 billiard PLN, p = 0,075. This means that the developed actions to the risk are effective, and the final version of implementation of the project has given base to make the decision to implement it.

SUMMARY

Risk management should be an integral part of the planning of development projects. Identification, measurement and evaluation of risks in the individual stages of the planning of these projects, allow reducing or eliminating the effects of the risks that may occur in the future. Risk management model, which was developed, is the tool which will help to make the decisions of development. Presented example of the risk management confirmed, the usefulness and effectiveness of this model in the planning of development projects in industrial enterprises in traditional sectors.

REFERENCES

[1] Z. Wilimowska: Ekonomika i Or ganizacja Przedsiębior -stwa 1 (2001), 19, 13-52.
[2] M. Sierpińska, T. Jachna: Ocena przedsiębiorstwa według standardów światowych, Wydawnictwo Naukowe PWN, Warszawa (2004), 393-395.
[3] J. Bijańska, Planowanie działalności inwestycyjnej kopalń węgla kamiennego, Wyd. Pol. Śl., Gliwice, (2006), 9-39.
[4] K. Wodarski, Zarządzanie ryzykiem w procesie planowania strategicznego w górnictwie węgla kamiennego, Wyd. Pol. Śl., Gliwice (2009), 39-133.
[5] K. Marcinek, M. Foltyn – Zarychta, K. Pera, P . Saługa, P. Tworek, Ryzyko w finansowej ocenie projektów inwestycyjnych. Wyd. Uniwersytetu Ekonomicznego, Katowice (2010), 128-133.
[6] A. Karbownik: Studium wielkości wydobycia projektowanej kopalni podziemnej węgla kamiennego z uwzględnieniem niepewności infor-macji, Zeszyty Naukowe Politechniki Śląskiej, Górnictwo, Gliwice 146 (1986), 72-94.
[7] P. Saługa: Ocena ekonomiczna projektów i analiza ryzyka w górnictwie. Wyd. Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN, Kraków (2009), 153-158.