

Author's Foreword

Risks management technologies for risk management in economic and engineering systems have been conducted for more than 15 years. This research field is new, extensive and constantly developing. Certain issues concerning the technology and its applications were raised in a number of articles and four books (E.D. Solozhentsev, V.V. Karasev, V.E. Solozhentsev. *Logic and Probabilistic Assessment of Bank Risks and Frauds in Business*, 1996; E.D. Solozhentsev, V.V. Karasev, V.E. Solozhentsev. *Logic and Probabilistic Risk Models in Banks, Business and Quality*, 1999; E.D. Solozhentsev. *Scenario Logic and Probabilistic Management of Risk in Business and Engineering*, 2006, also in English, 2009; E.D. Solozhentsev. *Management of Risk and Efficiency in Economy. Logic and probabilistic approach*, 2009; E.D. Solozhentsev. *I³-technologies for economics*, 2010).

We are going to describe new applications of *Risks management technologies* in engineering and economics and to consider the following new problems:

1. Components of *Risks management technologies*;
2. LP-calculus of *Risks management technologies*;
3. Building LP-models of failure risk for solution of difficult economic and technical problems;
4. Building LP-risk models of systems and processes invalidity in accordance with ISO 9001-2008 quality standard;
5. Building LP-models of bank operational risk in accordance with the requirements of Basel-2;
6. Assessment of probabilities of events on non-digital inaccurate and incomplete information expert;
7. Management of risk of development tests of machines, processes and systems;
8. Management of reliability of power of Metallurgical Combine;
9. Analysis of the risk of an explosion of ammunition storage;
10. Assessment and risk analysis of insurance against fire of a dangerous object.

This book *Risks management technologies* has a lot of examples of applications in economic systems and processes in order to make its contents more clear and aimed at the needs of economists and managers. The theoretical positions of *Risks*

management technologies are applied and in engineering and economic systems and processes, and evidenced by a number of the described applications.

I^3 -*technologies* provisions for managing risk and efficiency were evaluated at Eleven International scientific schools “Safety and risk modeling and analysis in complex systems” (St. Petersburg, IPME RAS, 2001–2011), where Russian and foreign scholars made more than 1000 presentations, devoted to safety and risk problems in engineering and economy. LP-models for a managing risk and efficiency in economy, banks and business interested German, Japanese, Swiss and Israeli universities which invited the author to make academic visits there.

At first risk LP-models were created for certain applications, followed by the attempts to develop a general risk LP-theory for engineering and economy, and, finally we came to realize that we need intellectual, innovative, information technologies (I^3 -*technologies*) for managing risk and efficiency. *Risks management I^3 -technologies* are:

1. Information technologies, as they imply databases (DB) and automatical processing of statistical data;
2. Innovation technologies, as risk LP-models are used, as well as LP-calculation and structural representation of systems and processes;
3. Intellectual technologies, as knowledge bases (KB) are built using statistical data as L-equations systems, which allows us to obtain new knowledge for management using risk and efficiency criteria.

Governmental and legislative bodies, companies and factories, banks and insurance companies deal with risk and efficiency. Thousands of specialists take daily decisions after risk and efficiency assessment. At the same time we need to assess the risk of unsuccessful decisions of difficult economic issues and failures of big projects.

The present volume deals with the basics of I^3 -*technologies* with risk LP-models and LP-software for managing risks and efficiency. The scope of *Risks management technologies* developments and research is presented, examples of their application in various areas are described. New possibilities of using rigorous methods for assessment, analysis, predicting and managing risks in economics and engineering.

We have for the first time studied *Risks management technologies* for assessment the risk of failure to solve difficult economic problems, in which the subjects solving the problem (the state, business, banks, scholars, public opinion), and the objects—the issues, constituting the heart of the matter, are logically connected as events. We have shown that without scientists (I^3 -*technologies* developers) and public opinion it is impossible to solve difficult economic problems in Russia.

The application scope of *Risks management technologies* is boundless. In this book one can find scenarios, logical and probabilistic risk models for credit risks, investment portfolio risk, bank operation risk, failure risk of a building and a transport company, insurance risk of fire hazardous facilities, risk of processes and systems invalidity, company management failure risk, bribery and corruption risk, analysis of risk and efficiency of a company, restaurant and a shop, risk management of the system development, etc.

The book is the first to describe *Risks management technologies*, its theory and applications on the basis of LP-models of risk and LP-software means. This is an exclusive Russian development of one of the trends of creating the methods of managing risk and efficiency, performed by St. Petersburg scholars. We are now developing the application of LP-calculation for the analysis of risk and efficiency of systems and processes according to statistical data (I.A. Ryabinin describes LP-calculation in his monograph *Reliability of Engineering Systems. Principles and Analysis, 1976*, where he introduces the terms “Boolean difference”, the argument “weight” and “value”).

For 25 years the author worked in industry as a technologist, head of computer centers and CAD/CAT/CAM departments and is well-acquainted with the practical aspects of automatization and its efficiency. Therefore the present volume is of practical character. Not wishing to idealize the solutions of certain real risk problems we have chosen the algorithm approach and discreet mathematics as the main methods of *Risks management technologies*. The algorithm approach to solving complex tasks gives us the opportunity to use the modern computation means and not fit the conditions of the problems into the narrow analytical approach, which usually leads us far beyond the real problems we had intended to consider.

The basic concept of the book is to describe components of *Risks management technologies*. We have singled out the classes of LP-models: LP-modeling, LP-classification, LP-efficiency, LP-forecasting and introduced following procedures: building LP-risk models, LP-identification of LP-risk models, LP-analyses of risk analysis, LP-management of risk, LP-forecasting of risk.

I^3 -technologies for managing risk and efficiency have high computational complexity and can be implemented only with the help of special LP-software means and computers. This work describes developed software complexes for LP-risk models of LP-modeling classes, LP-classification, LP-efficiency and LP-forecasting. At the same time in order to expand I^3 -technologies cheap software has to be created for training students of economics and for the daily use by thousands of economists and managers. A two-term course of *Risks management technologies* with 20 laboratory works on the computer is described.

It seems reasonable to create science centers dealing not only with the problems of nanotechnologies and nanomaterials, but also with the long existing problems of managing risk and efficiency of thousands of companies and systems in economics and engineering.

Innograd Foundation (Skolkovo, Moscow) could give funds for the project. The anticipated product are I^3 -technologies with techniques and software. *Risks management technologies* users are economic departments of governments of this country and its regions, banks, enterprises, companies, shops, economic and engineering departments at universities.



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With Logic and Probabilistic Models

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