Unfair Manipulations during Introduction of Project and Risk-Management System within Implementation of Investment Projects in Russian Industrial Companies, Big Data in Risk-Management

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Abstract. The process of creating a risk management system as part of the largest oil and gas company's investment projects is described. Examples of unfair manipulation with the risk management are given. Justification of efficiency of the chosen model and automation of the risk analysis process at each workplace is given. The expediency of using big data in risk management is described.

1. Introduction
Without exception, all global projects implemented with the use of modern methods and best practices of project management, do not meet the budget and deadlines. The main reason is the inability to make risk-oriented decisions and lack of management in conditions of uncertainty, incompleteness, and inaccuracy of information, inefficient risk management.

Management of different groups of investment project risks is one of the necessary elements of the project portfolio management system. The success of an investment project is often determined by the fact that it has been completed within the stipulated deadlines, as well as within the established budget and with quality compliance. In the context of the complexity, multifactoriality and growing uncertainty, it is almost impossible to meet project deadlines and budgets accurately. That is why an adequate and most effective risk management is needed in each case [1–3].

These projects are large, complex and capital-intensive, have many stakeholders, as well as related high requirements for efficiency and transparency in project management. All this leads to a lot of problems and risks during the project management. There are several risks that may lead to the failure of an investment project. First, it is a weak project study and change of technical and process requirements for the project after implementation of the critical scope of work. Lack of information on expectations and actions of other participants, lack of synchronization of work between functional departments, change of the project team membership, dismissal of project implementation participants, etc. may impair the project effectiveness. In addition, human factors may influence, such as overwork of leading employees and managers due to the inefficient organization of work and stress. In such cases, it may be difficult or even impossible to bring a project to a successful conclusion. Initial disbelief in schedules and other mechanisms, as they are based on unrealistic expectations, and the lack of feedback from implementers may become devastating to the project, as well as a poor discipline of actual information recording.
That is why it is important for the schedules to have a maximum quality and easy and convenient check. Only then will they be perceived by the process participants not as a burden, but as a functional tool of interaction. If an organization does not have a proactive response process, but only the "firefighting techniques" prevail, it will be difficult to successfully implement projects. Another reason for the failure may be the desire of the contractors, who were selected due to the initial low cost of the work, to increase the cost of the work through additional agreements. The motivation is also important. If the project controls only one parameter (e.g., budget, but does not consider the cost of the deadline failure), the executors are not motivated to offer options for optimization and efficiency improvement. If the team is focused on money spending only, they will not be motivated for timely completion of the scope.

All these problems are supposed to be eliminated by the Risk Management System. The solution being developed in oil and gas companies should allow to reduce the time expenditure on preparation, approval, and adoption of key management decisions, to reduce losses during the designing and construction of facilities, and to minimize the deadlines. Moreover, the Risk Management System, as part of the Integrated Project Management Information System, should facilitate the improvement of the project efficiency and manageability, as well as facilitate a compromise between the interests of different project participants. As a result, all this will lead to the creation of the necessary preconditions for oil and gas companies to achieve its strategic goals.

The necessity to implement and automatize the Integrated Project Management Information System is obvious. However, all companies face similar difficulties when choosing approaches. The current international and Russian standards for project and risk management do not provide a clear answer as to how to build the system properly. The latest trends in international risk management tell us that the quantitative methods of risk assessment should be applied for the most effective risk-oriented project management. In the case of project risk management, there are systems of simulation based on the Monte Carlo method.

2. Problems during implementation of risk-oriented management of investment projects
The major problems encountered during implementation of project management system elements based on international approaches and software products:

- The system works only if a full-featured calendar-based project network. And paradoxically, the process of its creation and regular updating often has several difficulties on large projects;
- Implementation and maintenance of the system requires significant financial investments and competent specialists;
- A difficult integration with the existing business processes of the company;
- Lack of statistical databases for many risk categories leads to the necessity of expert assessments. Which leads to a high level of subjectivity. We may draw a conclusion that subjectivity of expert assessments distorts result of the quantitative analysis of risks with use of more difficult mathematical models and process algorithms. Some companies use this sophisticated tool occasionally to demonstrate the results of the quantitative assessment, the objectivity of which is extremely difficult to verify. This tool is to some extent a means of temporal satisfaction of the investor's necessity to gain the information on the project status until the onset of an actual crisis. Thus, complication leads to several completely unpredictable effects;
- Lack of possibility to purchase foreign software complexes within the circumstances of import substitution and foreign sanctions;
- To date, we have not been able to obtain from foreign software manufacturers the numerical statistics on the effectiveness of Monte Carlo simulation using specific software products in large corporate systems.
3. Problem solving in risk analysis using a simplified model

After a long search for analogues of the imported software product for risk analysis, the Russian software solution RiskGap was found, which includes all necessary elements for qualitative risk analysis. This solution has the following advantages:

- Noticeable reduction in financial and time costs for implementation and maintenance;
- The algorithm design adapts to the conditions of Russian realities;
- Simplification of configuration package and painless integration into business processes of the company;
- Possibility to deploy the system on the company's server, which ensures the information security;
- No need for employees to have competencies to work collectively on risk analysis.

The developer offers to develop the product features according to the requirements of the customer. The first additional feature to be included is the use of the Kendall Coefficient of Concordance, which will help to identify the degree of consistency in expert opinions.

![RiskGap software interface](image)

Although today risk managers in Russian and around the world tend to transfer from qualitative risk analysis to quantitative assessment using the Monte Carlo method and other methods of simulation modeling, we have in practice come to the need to simplify approaches. A simpler mechanism of qualitative risk analysis is the most common in the world practice.

4. Unfair manipulation using risk management

In his 1954 "How to Lie with Statistics", Darrell Huff, a famous journalist and writer, describes various ways in which statistics can be misused to deceive and manipulate audiences [4]. It is very important to possess the statistics tools to understand all intricacies of this science and not to allow to mislead. The figures are a great tool when one needs to convince someone of something. It is necessary to apply a more complex algorithm observing mathematical laws, to bring unconfirmed statistics of authoritative analytical agencies, which the customer will not be able to check in any way. And it is possible to transform inexpedient, irrelevant in a specified field, in a specified company the development of regulatory and methodological documentation, training program for the personnel, software package into something reasonable and extremely necessary for the Customer. Without understanding where to look, when the "statistics illusionist" unfolds before us the calculations, the customer's representatives appear helpless and are subject to unfair manipulations.

The companies that provide consulting services and sell project management software, regularly try to influence the customers to encourage them to sign a large-scale contract or to choose a software
package for implementation of a complex management system of investment projects and project portfolios. To justify the reliability of analytical surveys, predicted values, effectiveness of their solutions, methodologies used in the risks analysis and predicted indicators of different values, as well as to justify anything impossible be checked in a short time, factors impossible to be checked as not used in the analysis, configuration of automated system modules, the companies resort to some manipulative "tricks". Undoubtedly, the more large-scale structure the Customer has, and the more large-scale projects are to be implemented using the Integrated Project Management Information System, the more opportunities for unfair speculation are available.

The research of a well-known analytical agency, conducted and published in 2017, is a vivid example of such unfair manipulations. The quality of information collection does not meet the requirements for statistical conclusions [5]. When conducting statistical research, special training is needed to achieve a high scientific level. The task of any statistical research is to collect objective, reliable and complete basic information. This is often difficult to achieve, and sometimes the questionnaire methodology is violated by several criteria to obtain the desired research result.

Thus, the questionnaire is a means of primary conclusions of the analysis. To compensate these disadvantages, the questionnaire should be combined with more meaningful research methods, the re-questioning should be performed, and the true purpose of the survey must be disguised from the test taker. These requirements were violated in the above-mentioned study. Table 1 presents one of the issues of this study. These products are a vivid example of the unfair manipulation. For a respondent who does not have a high level of maturity and who does not understand the effectiveness or applicability of a particular software product, the question may become a hidden advertisement.

Table 1. Question to assess the level of maturity of risk management in the non-financial sector companies

| Products | Products MS Office (Word, Excel, PowerPoint) |
|----------|---------------------------------------------|
| Basic products | SAP GRC                                    |
| ActiveRisk | RiskGap                                     |
| Proprietary databases | ModelRisk                                 |
| Oracle Crystal Ball | Deltek                                    |
| SAS | Other simulation products                   |
| Other (please specify) |                                              |

Declaring that the level of maturity of risk management in the Russian non-financial sector is low, consulting and analytical agencies encourage Russian companies to actively implement RMS with their participation.

Lack of statistical databases for most risk categories is a serious source of information misrepresentation. This leads to the necessity of expert assessments, which leads, in its turn, to a higher subjectivity level. Therefore, each enterprise needs to create a personal database and accumulate actual indicators of the implemented events. In order to create a reliable statistical base, it is necessary to conduct within a single system a regular collection of data on all parameters and indicators of implemented projects. It is advisable to use only those statistical data, which are accumulated directly in the company, only in this case one may achieve a high degree of reliability of information.

Moreover, the risk-manager may also use manipulative actions in order to achieve the various purposes, for example, disinformation of participants of the project implementation (to change the
statistical data, to allocate insignificant risks into a group of critical risks, etc.). In order to improve the analytics quality and the reliability of conclusions on the risk criticality, a maximum involvement of all project implementation team members is required.

5. Verification of forecasts

Today the most acute issue is the verification of forecasts, the procedure of checking its correctness, truthfulness or validity. The question of the fundamental possibility of forecasting cannot be solved without defining the criteria of the truthfulness of forecasts. If it is not possible to verify the truth of forecasts, it is pointless to talk about the scientific value of forecasting. It is well known that practice is the criterion for the veracity of our knowledge.

Daniel Kahneman is one of the founders of behavioral economics, a science which combines economics and cognitive science for explanation of the irrationality of a person's attitude to risk during decision-making and management of their behavior. This scholar is famous for his work on establishing a cognitive basis for common human misconceptions in the use of heuristics, as well as for the development of perspective theory. In 2002, Kahneman won the Nobel Prize in Economics for the application of psychological methods in economic science, especially in the study of judgment formation and decision-making in the conditions of uncertainty, despite the fact that he conducted his research as a psychologist and not as an economist [6]. People often believe that they act rationally and make decisions based on logic and facts. But actually, people systematically make the same mistakes because of the peculiarities of perception, which psychologists called cognitive biases.

Philip Tetlock, a professor of psychology at the University of Pennsylvania, perfects the accuracy of predictions for over 20 years and has conducted research for the U.S. IARPA, where discovered a unique issue. While the quality of predictions by political and economical professional experts is often very low, there are high quality predictors among quite ordinary people. Their forecasts are 78% better than by the control group and 30-70% better than by professional analysts [7].

Robert F. Engle is an American economist, specialist in economic statistics analysis methods, winner of the 2003 Nobel Prize in Economics for methods of analyzing economic time series with changing volatility over time. In economics, from the very beginning, Robert specialized in econometrics, which is the methods of economic and statistical analysis. His main scientific discovery, which brought him the Nobel Prize in Economics, he made while exploring the problem of volatility. Although real volatility is variable, economists have long possessed only statistical methods based on the assumption of consistency. In 1982 Robert developed the Autoregressive Conditional Heteroskedasticity (ARCH) model, on the basis of which the predictions of the volatility changes became possible. High accuracy of predictions using this model has been proved, in particular, in the analysis of historical and economic statistics of the United States and the United Kingdom. The Nobel Committee emphasized the great theoretical and applied importance of the ARCH-model. It has become indispensable not only for scientists but also for financial and market analysts, who use it to assess property and portfolio investment risks [8].

In practice, during assessment of management risks within the implementation of investment projects, during use of the simplest algorithms of qualitative analysis and a mathematical method to assess the expert opinion consistency by Kendall Coefficient of Concordance, a significant inconsistency of expert opinions has been established [9]. Various factors were noted during the analysis of the causes of this phenomenon: unwillingness to make an assessment, lack of critical thinking ability, in some cases lack of necessary competencies, and more cognitive mental biases. We may draw a conclusion that subjectivity of expert assessments distorts result of the quantitative analysis of risks.

6. Big data technologies and risk management

The use of Big Data technologies is extensive. According to a survey by IBM Institute, on the use of Big Data technologies in companies, most use Big Data in the field of customer service, the second most popular direction – operational efficiency, in the field of risk management, Big Data is less
common at the moment. It should be noted that Big Data is one of the fastest growing areas of information technology.

The distributed structure and high capital intensity of the energy industry lead to the daily occurrence of a variety of data that need to be collected and analyzed in order to improve the quality of risk analysis and project management efficiency. This is an incentive to introduce Big Data and Machine Learning technologies in the oil and gas industry into production processes, in particular, predictive or predictive Analytics systems.

Due to the current external environment, oil and gas companies are faced with the need to improve operational efficiency and optimize existing business processes. Having studied the world experience, the companies determined that Big Data and cognitive Analytics technologies will take one of the key positions in the portfolio of energy sector technologies in the near future.

References
[1] GOST R 51897-2011. ISO Guide 73:2009. Risk management. Vocabulary.
[2] GOST R ISO/IEC 31010-2011. Risk management. Risk assessment methods.
[3] Russian Recommendations R 50.1.103-2015 Risk management. Investment risk management process.
[4] Darrell Huff 1954 How to Lie with Statistics (cit. ex Russian translation: Alpina Publisher, Moscow)
[5] 2017 Assessment of the maturity level of risk management in Russia [Online] https://www2.deloitte.com/ru/ru/pages/risk/articles/maturity-level-of-risk-management.html.
[6] Kahneman D and Tversky A 1979 Prospect theory: An analysis of decision under risk. Econometrica
[7] Robert Fry Engle 2001 GARCH101: The Use of ARCH/GARCH Models in Applied Econometrics Journal of Economic Perspectives 15 (4)
[8] Tetlock PE 2005 Expert political judgment: How good is it? How can we know? (Princeton University Press)
[9] Kharchenko M A 2008 Correlation analysis: textbook for universities (Voronezh: VSU Publishing house)