

Kriz, Jiri; Smolikova, Lenka; Stepankova, Vladena

## Working Paper

# Management of projects risk with Business Intelligence

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**Management of projects risk with Business Intelligence**

**Jiří Kříž, Lenka Smolíková, Vladěna Štěpánková**

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## Management of projects risk with Business Intelligence

**JEL Classification:** O22, G32, D81

**Key Words:** *Risk management, Business Intelligence, Data Cube, Prediction Algorithms*

**Abstract:** Project management is characterize like the broader concept of a comprehensive set of management processes and activities that are limited in time and whose aim is to implement something specific, whether the introduction, change, etc. In project management, which aims to ensure effective management of a comprehensive package of activities to a greater or lesser extent, concerns virtually all organizations and from internal changes or activities, supply of products, the introduction of ICT technologies to large investment projects. Project management involves the application of knowledge, experience, skills, activities, tools and techniques so that the final project met its requirements and achieves its goals in a limited time interval. Between the initial and final state the project goes through several phases, including project risk. To eliminate these risks is determined by the risk management as an area focusing on analysis and risk reduction using various tools and techniques. If we seek to answer the question what is the risk, then in terms of project management it can be understood as the likelihood that an event occurs that is contrary to the assumption. The first stage is to identify risks. This is based on the areas covered by the project and cannot be generalized for different types of projects. For example, a project for the implementation of data warehouse will have different areas of risk than new product development. The next stage is risk analysis. At this stage, we try to find the level of risk and its impact on the completion of the project. We are looking for those risks which are important and have a significant influence on the project (priority risks). Following the planning and risk management, which proposes procedures to minimize risk, responsibility for the procedures and time frames in which the procedures are being implemented. The last phase is monitoring, which leads to elimination of risks, which are no longer relevant and to re-identify new risks. This entire process is appropriate to support software tool that allows us to their effective management. We can use Business Intelligence tools as one of the software tools, especially in the phase of risk identification and analysis. Identifying risks putting together a basic set of potential risks when the input use various available sources of information such as the previously identified risks files or lists the usual risks in managing similar projects. In the analysis phase, then we can make risk assessment of the potential risks, including the determination of their probabilities to create a catalogue of potential risks of the project, which must be addressed at the planning stage and management, Business Intelligence tools are with justification used for the suggestions to minimize risks. The article discusses the Business Intelligence tools and their application in the field of project's risk management. This is an opportunity to create panels, tables, graphs and matrices, including analyses of data cubes and to a certain extent and use of prediction algorithms for determining the probability of the risk and its impact on the implementation of the project.

### Introduction

Risk management in every part of interest, not only in project management is a systematic process that aims to identify and manage risk, in order to act on its appearance (minimizing or eliminating, (if it is possible) and controlling them), by implementing systems and procedures to identify, analyse, evaluate and address the risks inherent to any project. (Conroy & Soltan, 1998) (Raz & Michael, Use and benefits of tools for project risk management, 2001) Project risk management consists of three phases (Buchan, 1994) - risk identification, risk assessment and risk response.

Project management is becoming more and more integrated into organisation of all kind all over the world. About one third of the economic activity takes place in projects and the percentage is growing. (Bredillet, et al., 2007)

Risk management is a structured approach for the identification, assessment, and prioritization of risks followed by planning of resources to minimize, monitor, and control the probability and impact of undesirable events. (Smith & Merritt, 2002)

Risk management is an essential part of every kind of project because no project is free from risks. At any stage of a life cycle, a project is plagued with various risks due to the complex and dynamic nature. (Zhao & Chen, 2010)

Risk management is often left aside in project management practice, or is not given due attention. But the risk management can help project managers to anticipate delays that cause projects not to be delivered on time. (Grant, Cashman, & Christensen, 2006) The risk response plays a proactive role in mitigating the negative impact of project risks. (Miller & Lessard, 2001)

The project team with the risk manager should encounter risks throughout the whole life cycle of the project and in all of its phases especially in the post project phase too.

Smith described basic principles and guidelines for effective risk management and emphasized the importance of active risk management for accelerating projects and improving their success rates. (Smith P. , 1999) Raz et al. then performed an empirical study that reported - risk management practice is more applicable for higher-risk projects and appears to be related to project success. (Raz, Shenhar, & Dvir, Risk management, project success, and technological uncertainty, 2002)

Theoretical basis for the methods and algorithms of Business Intelligence tools were obtained from long-term study of selected professional publications, in particular by the following authors: (Kimbal & et al., 1998) (Kimball & Ross, 2002) (Inmon, 2005) (Lacko, 2003) (Smejkal & Rais, 2006) (Smalltree, 2006) (Howson, 2008) (Pour, et al., 2012) (Veerman, et al., 2009).

## Methodology of the research

There are the basic methods used with SQL Server Data Tools Analysis Services Multidimensional and Data Mining Project for prediction (algorithms for prediction the risk):

- **The Microsoft Decision Trees algorithm** is a classification algorithm that works well for predictive modelling. The algorithm supports the prediction of both discrete and continuous attributes.
- **The Microsoft Neural Network algorithm** uses a gradient method to optimize parameters of multilayer networks to predict multiple attributes. It can be used for classification of discrete attributes as well as regression of continuous attributes.
- **The Microsoft Clustering algorithm** uses iterative techniques to group records from a dataset into clusters containing similar characteristics. This is useful when you want to find general groupings in your data.
- **The Microsoft Association Rules algorithm** builds rules describing which items are most likely to be appear together in a transaction. The rules can be used to predict the presence of an item based on the presence of other items in a transaction.
- **The Microsoft Naive Bayes algorithm** is a classification algorithm that is quick to build, and works well for predictive modelling. The algorithm supports only discrete or discretized attributes, and it considers all the input attributes to be independent, given the predictable attribute. (Rankins, Bertucci, Gallelli, & Silverstein, 2013)

Other important task is the methods used in project risk management. The Business intelligence tools should help project manager to solve the problems effective and faster. The methods are divided according the project phase.

### Pre-Project Phase

Risks accompany the project team all the time and in all project life cycles. In the pre-project phase the project team along with the project manager analyse risks. First, the project team makes a list of all potential risks; here the most frequent method is brainstorming or another creative method Crawford Slip. Looking for risks the project team may not forget the risks arising from human failures, either. These risks are dealt with by the **HRA** analysis. The method is usually used in conjunction with other methods that allow quantification of results. If we apply the method using event trees or fault trees, it is possible to graphically illustrate the sequence of human failure and its impact on the result of project. (Obrová & Smolíková, The Role of Risk Management in Successful Project Management, 2013) The method should be employed by two analysts as a minimum that must be familiar with the interviewing technique; it is a very demanding method requiring experience on the part of the analyst in order to interpret the interviews in a proper manner. (Tichý, 2006)

There are also the tree techniques. The risk tree technique can be divided into two areas, event tree analysis (ETA) and fault tree analysis (FTA).

**ETA (Event Tree Analysis)** is a causal analytical technique used for an assessment of the progress of a process and its events leading to a potential incident. ETA method does not deal with causes of the undesirable event but considers further development of the event, thus providing a survey of probability of potential resulting events. The method is based on the principle of event monitoring and assessment of their sequence and mutual relations leading not only to the system failure but also to the system defects. The results of the ETA analyses include various incident scenarios. The method is used to identify and analyse system, project and process weak points. The output is a series of recommendations for reducing the incident probability and consequences. (Obrová & Smolíková, The comparison of selected risk management methods for project management , 2013)

**FTA (Fault Tree Analysis)** is a deductive technique focusing on one particular incident or major failure of a system and defining a method of specification of causes of such an incident. The fault tree is a graphical model showing various combinations of device failures and human errors which may result in a serious system failure. FTA is a qualitative instrument and its strength is in its ability to identify combinations of basic device failures and human errors that may result in an incident. (Obrová & Smolíková, The comparison of selected risk management methods for project management , 2013) FTA is an ideal analytical tool for very complex systems. (Fuchs et al, 2004) This method may also be used in the framework of quantitative analysis where the individual events are defined with regard to probability of occurrence with the result of probability of the peak incident (Korecký & Trkovský, 2011).

### Project Phase

In the implementation phase the project team must observe the risks. If a risk occurs that was previously analysed the project team introduces the envisioned measure. It may happen that a risk occurs that was not taken into account by the project team and then a measure for eliminating damage, if any, must be introduced as soon as possible. It may also happen that a risk previously analysed ceased to exist and there is no need to observe it any more. (Obrová & Smolíková, 2013)

### Post-Project Phase

In the last life cycle phase – the post-project it is necessary to evaluate and analyse everything. The team should prepare a document indicating how risks were handled during the project implementation. In most cases, the project team compares the risks analysed in the pre-project phase with those occurred in the implementation phase. An outcome of the implementation phase should have the form of a list (or risk catalogue or risk register) that could be used in the new projects to come. (Obrová & Smolíková, 2013)

### Risk

Generally, the term risk is called a threat, a potential problem, the possibility of failure or failure, damage, loss, risk of damage, etc. Risk expresses a degree of uncertainty. They can be characterized as the probability of achieving a result that is different from what you expected.

The concept of risk is related to the concept of uncertainty. It is the possibility of different outcomes, the probability is quantified. The comparison of risk and uncertainties are in Table 1.

**Table 1.** Comparison of risks and uncertainties

Dimension	Risk	Uncertainty
Measurability	Measurable	Unmeasurable
Methods	statistics and probability	subjective estimate
Data	quantitative data	qualitative data

Source: (Merna & Faisal, 2007)

Risks in projects related primarily to internal and external environment, innovation, change, and resources and we can prevent them effective management of project risks. Each risk can be expressed its characteristics, the most important are:

- The level of probability of risk - the possibility that the risk will
- The level of risk
- Risk Impacts - consequences which occur when there is risk situation
- Predictability of risk - the chance that the risk can be identified in advance and anticipate
- The level of risk suggestibility

- suggestible
- partially influenced
- not suggestible
- relation to the organization
  - internal risks - those types of risks can influence and control
  - external risks - those types of risks cannot directly influence, it is the environmental factors
- The order of action - formation and removability
  - primary
  - secondary - those types of risks arising from the elimination of the primary risks
  - residual - it is a risk that is acceptable
- The amount of risk
  - small
  - medium
  - great
- The degree of acceptability (acceptability, acceptability)
  - necessary (required)
  - tolerable (acceptable)
  - intolerable (unacceptable)
- The probability of occurrence and effect
  - unprovable
  - low probable
  - probable
  - very probable
  - almost sure
- Scope of action
  - systematic - this type of risk applies to all types of projects
  - unsystematic - this type of risk is only valid for a certain type of project

In addition to these characteristics the risks can be classified by type, for example, operational risks, technological risks, production risks, information risks, economic and financial risks, marketing risks, social risks, and natural hazards and some others.

When comparing decision making under risk and decision making under uncertainty it is essential, that in the decision-making under risk we are able to determine the probability of risk events and in conditions of uncertainty, this probability is there unknown.

If we are able to determine the probability of the risk, we have more information and we are able to make decisions based on knowledge. This is the assumption for using of Business Intelligence tools beyond the known and standard procedures for project risk management.

### **Project risks**

Project risks include all kinds of risks that could in any way threaten the project. Key project risks are those that threaten the goal, time and project costs. Frequently may occur due to changes in the project, poor communication, or due to changes in internal and external circumstances and conditions.

Risk management is a continuous activity, which can be characterized by these interrelated phases:

- Identify project risks
- Evaluation of project risks
- Elimination or manage project risk
- Monitoring of potential project risks

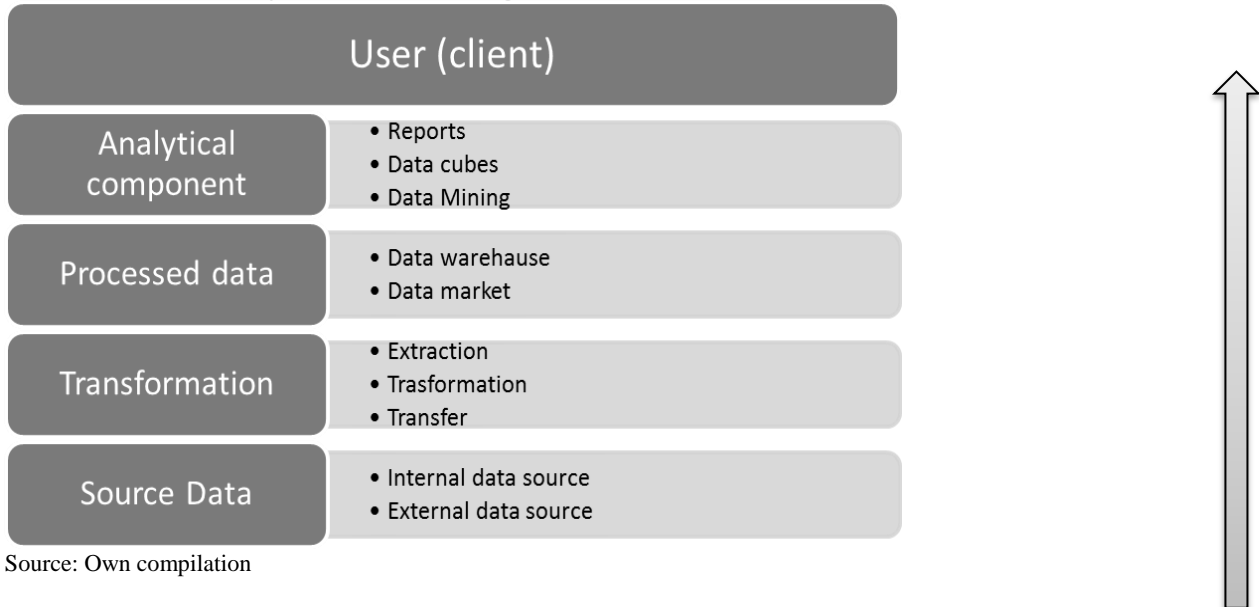
The target solution is to reduce the probability or reduce the impact of risks during project implementation. The project is key risk prevention, especially in the planning phase of the project, the ability to timely identify risks, eliminate and prevent problems that might occur in the project. Significant is also the ability to manage changes in project implementation, which in most cases are the most common source of project risks.

## Business Intelligence in project risks

Generally, we can term Business Intelligence characterized as converting large volumes of data to knowledge, which are required for end users. These can then be used effectively in the decision-making process in various activities. The essence of all the data is that there are hidden some information, that we are able to detect if we add to the data the context. Consequently, we are able to acquire the knowledge, or rather the ability to evaluate knowledge and its application in practice.

Simplified Business Intelligence hierarchy is shown in Figure 1.

**Figure 1** – Hierarchy of Business intelligence



Source: Own compilation

Due to the fact that today's modern database platform include extensive support for building data warehouses (data warehouse), (OLAP cubes) and data mining (mining, uncovering data), these platforms can be used advantageously as a comprehensive solution and project management, including project risk management.

As noted in chapter risk, secondly, can be characterized, but also to classify. In the case of decision under risk is essential that we are able to determine the likelihood of the risk occurring.

So we have available data from internal and external systems, which can be put into context and explore their mutual characteristics according to the type of risk, focusing on systematic, unsystematic, internal and external. Based on this division we are using Business Intelligence tools to further investigate possible links and similarities in data aimed at further risk characteristics.

## Conclusions

Using OLAP analysis (data cubes), which allow to examine data from a larger number of dimensions than two (two dimensions can be thought of as a classic excel tables or tables in a relational database), and then using different methods of data mining, we are able to analyse or predict, including determining the degree of probability of the risks within projects are most likely, what is the likelihood of their elimination and likely impact on target project.

Data mining is still one of the fastest growing segments of Business Intelligence. It is principally based on heuristic algorithms, neural networks and other advanced software technologies and artificial intelligence methods. It is used in the analysis of trends and predicting events.

It was historically primarily deployed for analysis and prediction of various business applications. Gradually, with the development of this technology was progressively deployed to other areas such as the analysis and prediction of credit risk, the risk in issuing credit cards, etc.

Regarding the implementation of complex business intelligence tools into database platforms, there is no longer need to rely on specialized solutions in this area and we are able to use these tools to

streamline the process of project risk management more complex methods than are currently in common use.

The concluding paragraph should provide a neat summary of the main discussion of the paper and possible directions of future research. In conclusions it is not necessary to take new matter which was not discussed in the paper.

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