

# RISK REGISTERS IN CONSTRUCTION IN CROATIA

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Based on overall research results and the current situation in practice, it is clear that risk management practice in the Croatian construction industry is at quite a low level. In order to improve it, a risk register needs to be implemented in regular construction company business. The main research results on risk in construction are presented, as well as the current role of the risk register; its form and its prevalence in the Croatian construction industry. The study is set in the context of the current Croatian approach and problems compared with the situation in the world. Suggestions are given for the development and implementation of the risk register in the Croatian construction industry, presented with model of a Risk register system.

Keywords: construction industry, development, risk management, risk register, structure.

## INTRODUCTION

The recognition of poor knowledge and practice of risk management in construction in Croatia initiated research into the topic at the University of Zagreb, Faculty of Civil Engineering. Today, risk management in construction is a very interesting subject to write about, and it is frequently discussed, but practice is still at an inadequate level.

It is understood that the first obstacle in risk management implementation in construction companies is knowledge of risks per se. Just as humans learn and gain experience from their mistakes and the mistakes of others, so companies must be enabled to do so by the provision of a "permanent brain" of the company. Among other things, the risk register is considered as a repository of knowledge on risks, therefore our aim is to come up with directions for a risk register structure design for use in construction companies.

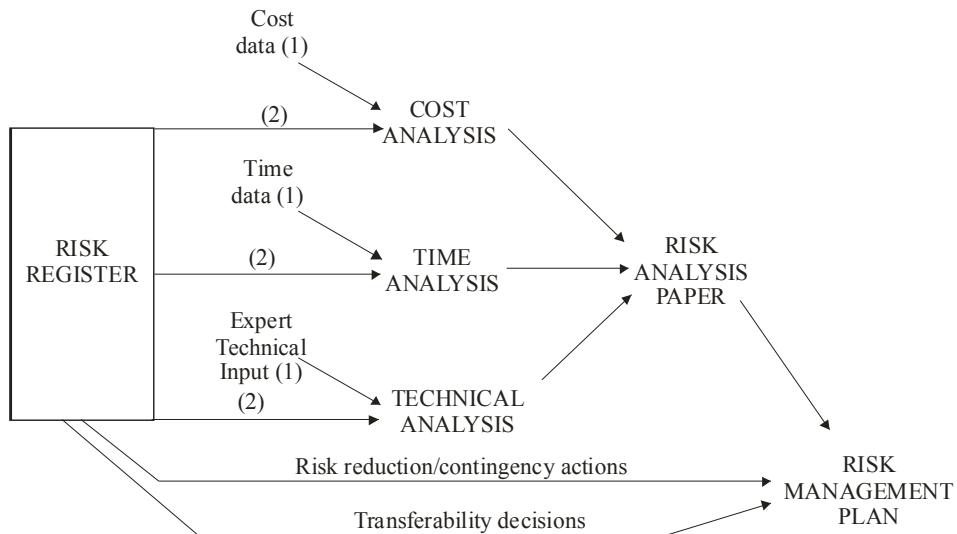
## ON THE RISK REGISTER

There is virtually no literature on risk management which doesn't mention the risk register, or risk log, as part of risk management methodology, but the design and structure of a risk register is dealt with less frequently. However, companies which want to be competitive in the market practice risk management in some form and therefore store data on risks in some form of register. Research conducted by the Design Information Group at Bristol University (Patterson and Nealey 2002) showed that 67% of respondents documented risks in either paper or computer-based registers and 78% of them developed in-house risk register computer systems, but information on the form, structure and origin of them is unavailable.

While frequently mentioned, not all authors treat the risk register in the same manner. The approaches can be classified into three categories. In the first, the risk register is

considered as a by-product, a document containing information on project risks, giving it a marginal role. The second category elevates the role of the risk register defining it as a useful tool in the risk management or risk-assessment system. Finally, in the third category, the risk register is treated as a central part of the risk management process, this will be analysed in detail.

Williams (1994) is one of the first authors to assign the project risk register a central role as "...*a repository of a corpus of knowledge...*" and "...*to initiate the analysis and plans that flow from it...*", thus defining it as key tool for the integrated analysis of time, cost and technical risks as is shown in Figure 1.



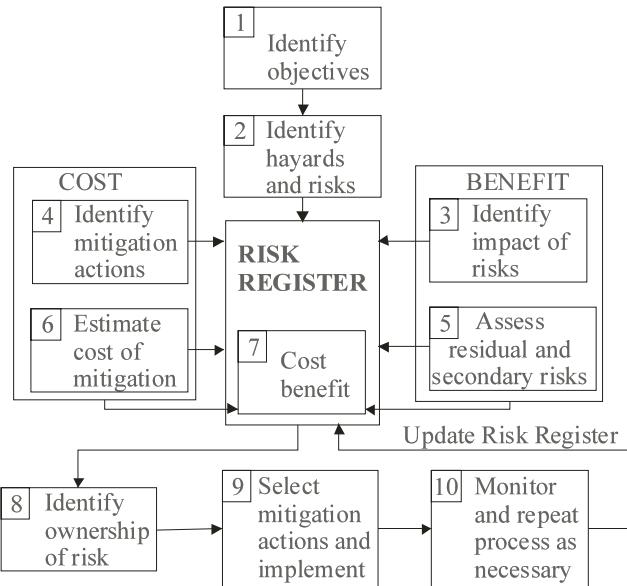
**Figure 2** Flow of analyses and plan from risk register (Williams 1994)

(1 - deterministic and aleatoric uncertainty data, 2 – epistemic and major aleatoric uncertainty data

Barry (1995) defines the risk register as a comprehensive risk assessment system, used as a formal method of identifying, quantifying and categorising risks and providing the means of developing a cost-effective method of controlling them.

Patterson and Nealey (2002) developed the Risk Register Database System for the Automotive Manufacturing Industry which consists of a Risk Register and Risk Assessment Tool to take the central role in Risk Management Methodology. The Risk Register, apart from the register itself where risks are stored after having been identified and assessed, contains two supporting documents: Risk Owner and Risk Reduction and/or Mitigation Plan where additional information on risks is stored. The Risk Register is described as a tool used as a means of recording and documenting the information generated through the use of the Project Risk Management process, which enables users to consciously evaluate and manage risks as part of the decision-making process.

Godfrey (1996) proposed ten steps to risk control (Figure 2) and placed the risk register in the centre of the process. It is considered as the outcome of risk assessment and the means of recording and controlling the risk management process.

**Figure 3** Ten steps to risk control (Godfrey 1996)

## RESEARCH ON RISKS IN CONSTRUCTION IN CROATIA

### Risk sources and drivers research results

Much research and many reports in the 1990s showed poor results regarding planned time and cost overruns of construction projects. Focusing on time and cost overruns of construction projects, risks have been investigated by a research project at the Faculty of Civil Engineering, University of Zagreb since 1996 and have resulted in numerous research papers and several MSc and PhD theses. The first results, based on a sample of over 300 construction projects finished between 1996 and 1998 in Croatia (Radujkovic 1999), showed a 60% time overrun and a 32% cost overrun.

**Table 3** Risk Breakdown Structure (Radujkovic 1997)

1. EXTERNAL SOURCES OF RISK IN PROJECTS				
1.1. LEGAL	1.2. POLITICAL	1.3. ECONOMIC	1.4. SOCIAL	1.5. NATURAL
Local regulations	Change in politics	Economic politics	Education, culture	Climate
Permits, approvals	Elections	Prices, taxes	Seasonal work	Foundation
Changes in law	War	Financing	Strikes	Fires
Standards	Treaties	conditions	Fluctuation in currency value	Earthquakes
		Currency value	Fluctuation in population	Floods

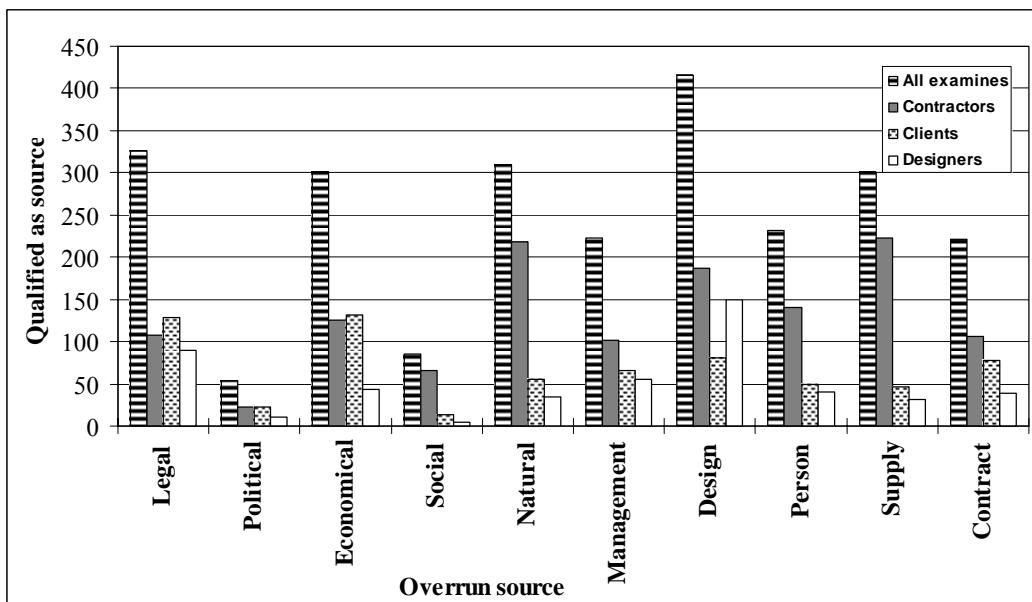
  

2. INTERNAL SOURCES OF RISK IN PROJECTS				
2.1. MANAGEMENT	2.2. PROJECT DOCUMENTS	2.3. PEOPLE FACTOR	2.4. SUPPLY AND LOGISTICS	2.5. CONTRACTS
Unrealistic goals	Superficiality	Productivity	Shortages	Type of contract
Poor control	Inaccuracy	Illness	Availability	Short time frames
Technology	Incompleteness	Motivation	Reliability of equip.	Unrealistic prices
Organization	Updated documents	Errors	Insufficient workers	Party relations

The research addresses an even more important question – what are the sources and drivers of these overruns? For that purpose, sources of risks were structured according

to the resource breakdown structure presented at the Risk Management Congress in Helsinki 1997 (Table 1), which was also used for later research work.

Later investigations produced data on the most frequent sources of overruns on the second level of RBS by questioning three key project participants (Figure 3).



**Figure 4** Key overrun sources according to examinees

On the third level of RBS, a critical combination of sources that had a negative impact on project outcomes was found, such as changes in the project, problems with financing, poor organization, conflicts with legal procedures, and unrealistic goals. Moreover, the most serious impact on overruns was changes in project documentation and design, which is nothing more than project scope changes.

### Survey on risk registers in construction

During this extensive research, a database of more than 700 projects was created with identified sources of risk and associated time and cost overruns. These data, collected over 10 years from different types of construction projects, are considered very valuable for future risk management development in Croatia. In order to make the data available in future, proper storage is needed. The risk register is a means of achieving this.

The first step of the research is to gather initial information on the practice of storing data on risks in construction projects. Based on previous research on risk management practice no systematic risk register system was expected to exist, but the aim is to find out what current practice is, what the perception of a risk register is, and what the benefits of a risk register are considered to be.

Previous research findings showed that risk management practice in construction was at very low level. Preliminary results of the latest pilot questionnaire devised for the risk register survey showed some improvements in the current situation, basically because of awareness of its importance, but the situation remains far from satisfactory from a practical as well as theoretical point of view. The risk management in practice encompasses a non-comprehensive risk identification phase, some risk assessment and response at the contingency level, with no systematic risk analysis or

reduction/mitigation plans and certainly no risk monitoring and control. Improvements are evident in the fact that basically large contractors and investors/owners do register the risks that influenced time, cost, and quality in the form of written reports but they are not sorted into any form of table or spreadsheet.

From the available literature, various statements defining risk registers were extracted and respondents were asked to choose the two that they thought best described risk registers. Three statements were selected most frequently, from three different sources, Williams, Barry, and Patterson and Nealey, which are described above. From this we can identify the characteristics that the risk register should have: it has to serve for integrated risk analysis, recording and documenting the information generated through the use of the Project Risk Management process. It is also considered as a tool for comprehensive risk assessment, for identifying, quantifying and categorising risks and it has to enable the conscious evaluation and management of risks as part of the decision-making process.

The most important possibilities that the risk register has to enable are:

- a. documenting risk source, response and its classification
- b. saving information on all risks identified at the beginning and through the project life cycle
- c. prioritizing risks regarding likelihood of occurrence and impact
- d. systematic data storing to establish repository of knowledge for future projects

All respondents said that the risk register would facilitate the improvement of risk management practice and that they would use a risk register system customized for construction.

The survey results confirmed our assumption that risk registers are needed in construction in Croatia and clarified the guidelines for designing such a register.

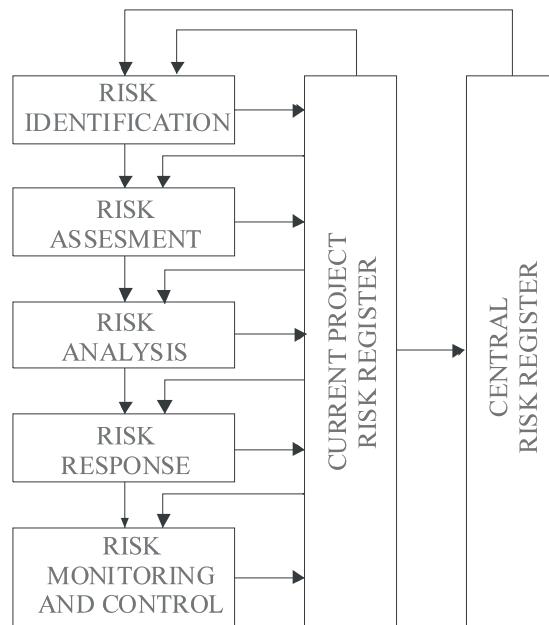
## **PROPOSED MODEL FOR RISK REGISTER SYSTEM**

In order to explain the proposed model of the risk register system (Figure 4) it is first necessary to define its parts. It is very important to distinguish between the two levels of risk registers for the same stakeholder (company).

To fulfil the clearly defined requirement to save information on all risks identified at the beginning and through the project life cycle, the model must have a risk register on the project level called the Current Project Risk Register (CPRR). This has the role of platform for the entire risk management process and is a useful tool for project risk management. This is the first level of the model, the current project level where CPRR becomes a central part of the project risk management process.

After completion of the project, each stakeholder (company) will store the information from the Current Project Risk Register in the Central Risk Register in order to make it available to future projects – this is the second level. It is clear that not all information will be valuable for saving in the Central Risk Register. Though projects are non-repeatable in their entirety, some parts of them are repeatable and may be used for future projects. In the design of the Central Risk Register it is very important to make it clear what data can be of use for future projects and to devise a filter for data from the Current Project Risk Register.

The Central Risk Register must fulfil the requirement to provide part of "the brain" for the company regarding risks, so it should be structured and designed as an advanced database system with special attention to customization in the construction environment.



**Figure 5** Model of risk register system

It is important to emphasize the importance of data quality generated from risk identification and assessment for CRR, which include sources, drivers, risk owners, environment, and ranking. By providing data based on previous projects, the CRR will become one of the tools for project risk identification, something that requires special attention. This role will be particularly important in the first phase of implementing the system in regular company business. Saving data from the Risk Response and Risk Monitoring and Control phase has multiple benefits. Not only for saving original risks from the identification phase, but also actual risks which have great importance in upgrading the CRR and contributing to its reliability. Comparing initial response plans and actions with their effects will promote further development and will raise the quality of risk management in construction companies by providing knowledge of the best practice.

In order to become a part of the "company brain", integrity and consistency are even more important than the components of the CRR and special attention must be given to making all data searchable and results reliable.

## CONCLUSIONS

The research and application of risk management theory is essential in achieving project success in many business sectors. Every construction project has its share of complexity and turbulence that very frequently cause deviations from the initial project goals. Therefore, project management teams should apply all available advanced methods and tools for dealing with uncertainty and changes. The application of the risk register is essential for many reasons: learning from the past, collecting best practice, and providing a supportive tool. The application of an adequately structured

and designed risk register can significantly contribute to success not only at project level, but also at company level.

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