**Risk & Decision Making in Research Environment.**

Anastasia Kalugina, Thierry Meyer

 *Ecole Polytechnique Fédérale de Lausanne*

*Institute of Chemical Sciences and Engineering; EPFL SB ISIC GSCP, CH-1015 Lausanne Switzerland*

*\*Corresponding author: Thierry.meyer@epfl.ch*

**Highlights**

* Laboratory Risk profile is not limited by the number of Hazards.
* Underestimation of the Human Factor might lead to severe consequences.
* Real Risk Reduction Potential of the Measures is influenced by the Feasibility of them.

**1. Introduction**

During the last decades, many studies have been carried out on topics related to risk and decision-making (DM) in different sectors of economics. With an improvement in quality of life, as well as the introduction of Corporate Social Responsibility principles, more and more companies’ resources are spent on safety enhancement. Generally, risk management (RM) and DM tools are only developed in the business environment. However, when talking about Academia, one has to consider this environment as safe. In order to keep such brand image, universities have to implement an effective system of risk management. An essential part of the RM process are the risk assessment and the DM steps. Due to the complexity of the Academia environment (different cultural background of the employees and students, high turnover, explicit professional features of the individuals and the important role of their creativity), the decision-making process becomes more complicated. Thus it requires a tool which takes into account the entire specific features of the environment and allocates resources according to the objectives, reducing the risk to an acceptable level. The objective of this project is to develop such a methodology which will allow making optimal decisions according to the settled objectives.

**2. Methods**

A combination of various qualitative and quantitative research methods has been used: unstructured interviews of safety experts, surveys, participant observations, case studies and simulations. Some of the qualitative data obtained have been transformed using semi-qualitative research methods such as FAHP (Fuzzy Analytical Hierarchy Process) and TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution).

**3. Results and discussion**

In order to build a useful decision-making tool, it is important to have reliable outputs from the Risk Assessment step. The model is built in such a way that it considers the Risk as a 3-component phenomenon (fig. 1). The legal component of the risk [1] allows decision makers to choose among binding and optional measures. The introduction of the Human Factor [2] allows decision makers to choose among different corrective measures, those which are more suitable in the specific working environment. Furthermore, the Human Factor serves as a signal to act on the improvement of the Safety Climate. Hazard indexes are evaluated based on the model proposed in the Laboratory Assessment Risk Analysis (LARA) method [3]. According to this method, the risk is calculated in relation to each particular Hazard and represents a combination of several parameters, which cumulatively give the value of the Laboratory Criticality Index (LCI).

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**Figure 1.** Decision-Making tool.

The next step of the RM process is the evaluation of the chosen corrective measures. It is important to consider their effectiveness from the risk reduction perspective, but also take into account how suitable they are in the specific working environment and in relation to the processes analyzed. Six parameters influencing the decision-making process have been identified based on the observations of the audits conducted by the OHS group at EPFL and following discussions with safety engineers or safety specialists. Two parameters describe characteristics of the measures which are affected by the Human Factor, three parameters address the technical effectiveness of the measures and one parameter is an indicator of cost-effectiveness. The six parameters are combined together in one parameter – Feasibility. Based on the results of the Risk Assessment and Evaluation of the measures, Fuzzy-TOPSIS is then used for a Resource Allocation optimization.

**4. Conclusions**

The model described here for Decision-Making in a research environment is a flexible tool that can be applied to different laboratories, where different safety climates, risk profiles and financial situations are present. This method allows decision makers to obtain optimal safety decisions depending on the settled objectives. It is multi-objective and can be used not only by experts but also by inexperienced users for interpretation.

**References**

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