Risk Management

Qualitative Risk Assessment, a Risk Matrix and a Risk Map

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Introduction

Qualitative risk assessment can be characterized by the speed of execution, relatively low requirements on the input data and lower demand for the necessary financial resources, although, the accuracy, transparency and reliability of the results is relevantly lower in comparison with the quantitative analysis.

This is because it does not require expression of the probability of activation sources of hazard in numerical values and appreciation of the consequences of undesirable event in monetary units.
Introduction

Qualitative analysis is based on an expert's estimate, both the probability of activation of the source of hazard and consequences of undesirable event.

It allows us to easily and quickly identify critical risks of assessed systems, and can be recommended especially for systems for which have not yet been implemented risk analysis, or where the speed of identification of critical risks and minimum of needed resources are preferred.
Comparison between qualitative and quantitative analysis

Advantages of qualitative analysis:

- lower demands on erudition and knowledge of the implementation team;
- lower costs on execution;
- lower demands on human and material resources;
- little need for program equipment;
- simple calculations;
- speed for execution related to the speed of identification of critical risks and implementation of measures for their reduction.
Comparison between qualitative and quantitative analysis

Disadvantages of qualitative analysis:

- lower accuracy of received outputs in comparing risks caused by different hazard sources
- lower correctness of the outputs, které mají spíše orientační hodnotu;
- lower reliability of received results;
- worse transparency of the process;
- lower orderliness;
- difficult control of the costs.
Comparison between qualitative and quantitative analysis

Mentioned methodics don't stand against each other, they are complementary.

Qualitative risk analysis is applied:
- on systems, where have not yet been implemented risk analysis
- for system, where it is neccessary to quickly assess and identify critical risks, which threaten ekonomical entity or society

As soon as the critical risks are idenfified, they may be, if it is required, resp. if it is requested by top management, quantitatively specified.
Definiton of qualitative risk analysis

Risk can be defined from a qualitative aspect as the possibility that with a certain probability the undesirable event will happen, that will be different from the expected state or development, and which will cause higher or lower losses on movable or immovable property, harm to human health or environmental burden.
Process of qualitative risk analysis

Qualitative assessment includes:

- verbal expression of the probability (frequency) activation of source of hazard

- and / or verbally expressed vulnerability of assets from which results the impact of undesirable event given by the costs of renewal (sanitation) of damaged asset, respectively. for the purchase (acquisition) of new, destroyed asset.
Process of qualitative risk analysis

The basis for risk estimation of system is the equation (1):

\[ R(t) = p(t) \times N(t) \]  \hspace{1cm} (1)

where \( R(t) \) represents a risk, \( p(t) \) the probability of activating the source of hazard, and \( N(t) \) impacts of undesirable event depending on time. Nevertheless, the impacts (consequences) of undesirable event reflect the vulnerability of the assets of relevant hazards.

The third factor on which the risk level is dependant is time \( t \).
Process of qualitative risk analysis

If there is for each j-th hazards assembled, all pairs hazard / vulnerability against each i-th asset of the system, it is possible by using equation (2) derived from the equation (1) to calculate for the investigated system (unit, military training areas, economic operators, public or private organization, object, etc.) risk \( R_j (\tau) \) that results from j-th hazards in a given time \( \tau \).

\[
R_j (\tau) = \sum_{i=1}^{q} p_j (\tau) \times N_{j,i} (\tau) \tag{2}
\]

Where \( p_j (\tau) \) is the probability of activating j-th source of hazard and \( N_{j,i} (\tau) \) impacts reflecting the vulnerability of i-th asset of the studied system towards j-th hazards in time \( \tau \).
Process of qualitative risk analysis

Graphical representation of risk

# Process of qualitative risk analysis

## Risk matrix

<table>
<thead>
<tr>
<th>Probability</th>
<th>Impact of undesirable event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>negligible</td>
</tr>
<tr>
<td>negligible</td>
<td>A</td>
</tr>
<tr>
<td>marginal</td>
<td>A</td>
</tr>
<tr>
<td>small</td>
<td>B</td>
</tr>
<tr>
<td>medium</td>
<td>B</td>
</tr>
<tr>
<td>high</td>
<td>C</td>
</tr>
<tr>
<td>very high</td>
<td>D</td>
</tr>
</tbody>
</table>

*Risk: A = negligible, B = marginal, C = small, D = still acceptable, E = tolerable, F = unacceptable.*
Process of qualitative risk analysis

Risk map

Unacceptable risks.
It is necessary to stop the activity or immediately implement suitable countermeasures.

Tolerable risks.
It is necessary to take countermeasures by a certain deadline.

Acceptable risks.
Countermeasures are implemented with the agreement of management of assessed entity.

Negligible risks.
Countermeasures need not be implemented but risks are suitable to monitor.

Matrix and risk map

Matrix and a risk map are output of qualitative integrated risk assessment.

Serves as:

- tools to prioritize risks;
- defining of serious and unacceptable risks;
- streamlining the next phases of risk management;
- defining risk position of system;
- more effective firm management.
Conclusion

Qualitative risk analysis represents compared with the quantitative analysis simple, fast and cost-saving method, not requiring a wide range of input data.

In practice, it is often used especially for systems in which has not yet been implemented risk analysis, and when it is needed urgently to establish priorities in the field of risk reduction so there can be efficiently allocated financial, material and human resources.

These benefits, on the contrary bring lower accuracy, correctness and thus the reliability of outputs, low transparency of the process and difficulties in controlling expenses.
Conclusion

Basis of qualitative risk analysis is to identify all pairs of hazard / vulnerability of all assets of the studied system along with simultaneous determination of their levels in a verbal evaluation.

The vulnerability of asset from hazard reflects the impact of potentially undesirable event.

The risk system in relation to hazard is given by intersection of verbal expression of the probability of activation of the source´s hazard and costs associated with the renewal of all damaged and the cost of purchasing all assets destroyed as a result of an undesirable event in a time $\tau$.

The output of the analysis is shown in risk matrix or risk map.
Seminar to the T13

Students will become familiar with the advantages and disadvantages of qualitative risk assessment in comparison with quantitative way and learn the procedure for obtaining qualitative analysis of outputs especially in the form of risk maps showed the in risk matrix.

Formed groups of 3-5 students will implement a simple qualitative risk analysis system (part of the department, military training area, households, establishments, public institutions, region) and they will create risk map for the chosen system. To do this, they will use the results obtained in previous exercises.