Risk Management in Seaports

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Institute of Business Logistics and General Management (LogU)
Hamburg University of Technology (TUHH)
Introduction

WP1  Project Management and Administration
    ➔ Lead Partner: University of Turku (FI)

WP2  Joint Exercises and Communication in Emergencies
    ➔ WP Leader: Southwest Finland Emergency Services (FI)

WP3  Regulatory Framework on Safety & Security
    ➔ WP Leader: University of Borås (SE)

WP4  Risk Assessment and Analysis
    ➔ WP Leader: Hamburg University of Technology (DE)

WP5  Equipment Testing
    ➔ WP Leader: Hamburger Hafen und Logistik AG, HHLA (DE)
WP4 Core Contributors

- PP1: University of Turku
- PP2: Hamburg University of Technology
- PP4: Viimsi Municipality
- PP6: Vilnius Gediminas Technical University
- PP10: University of Borås
- PP15: Polish Safety and Reliability Association

We are grateful as well for the wonderful contribution and cooperation of the other partners from all work packages in the WP4 meetings and workshops.
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Risk management (RM) in seaports

Potential consequences of accidents and incidents

• Port closure

• Damage to people, property and the environment

• Service delays or disruption of supply chains
Risk management in seaports

Activities

Port A

Port B

Improved use of risk management

“Risk management is the systematic identification of risk factors and preventive activities with the implementation of measures to limit the effect of different risks.”

“Risk management is doing everything economically possible to prevent and mitigate possible risks.”

“The risk group consists of couple of individuals, organizing risk mappings for different units/divisions [that are] responsible for the summaries of the key risks going to the management group.”

“Our operational risk management is based in the nautical headquarters. That has five navigators who are all authorized to make decisions. We also have instructions for each situation and scenario.”

Need for a standard process
ISO 31000:2018 as a standard process scheme for risk management

Cranfield (2003); Müssigmann (2006); Tummala and Schoenherr (2011)
## Agenda

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ISO 31000:2018 development process

• International Organization for Standardization (ISO) is the world's largest developer and publisher of International Standards.

• ISO31000:2009 was published in November 2009 and it is the result of four years of consultation between risk and standards experts in 30 countries.

• It pulls together and replaces a number of similar international standards. AS/NZS 4360:2004, which was due for revision in 2009, formed the basis of ISO31000.

ISO 31000:2018 characteristics

• ISO 31000:2018 is not intended for certification.
• It does not contain compulsory requirements.
• It is a collection of suggested best practices.

• Guide to help in developing specific processes
• Flexible application
ISO 31000:2018 risk assessment process

• Risk identification
  – Identify sources of risk, areas of impact and consequences

• Risk analysis
  – Estimate probability of event occurrence
  – Estimate severity of consequences in case of event occurrence
  – Combine probability and consequence in risk scale

• Risk evaluation
  – Compare the level of risk established in the previous stage with the risk tolerance criteria established
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4. Risk assessment - methods
5. HAZARD online toolbox
Groups of risk sources

- **Risk sources**
  - **Natural**: Occuring processes in the environment
  - **Man-made**: Processes due to intentional or unintentional actions
Breakdown of natural risks: examples

- Geophysical
- Hydrological
- Metrological
- Natural
- Earthquakes
- Flood
- Hurricanes

Breakdown of man-made risks: examples

BSR seaports focus on different risks

*Comparison of scope and type of covered risks as percentage of interviewee opinions by country (38 interviews in total)
Agenda

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Risk assessment methods

1. Qualitative techniques
2. Quantitative techniques
3. Semi-quantitative techniques

John et al. (2016)
## Risk assessment methods

<table>
<thead>
<tr>
<th></th>
<th>Qualitative techniques</th>
<th>Quantitative techniques</th>
<th>Semi-quantitative techniques</th>
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<tbody>
<tr>
<td>1</td>
<td>Is used whenever there is a lack of information, resources and/or time</td>
<td>Is used in more complicated or high-technology industries</td>
<td>Combination of qualitative and quantitative techniques</td>
</tr>
<tr>
<td></td>
<td><strong>Subjective evaluation of the probability and severity</strong></td>
<td><strong>Probabilistic approach to rank and appraise risks</strong></td>
<td><strong>Intermediary approach to judge risks</strong></td>
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Risk assessment methods in BSR (1):
Risk Identification (excerpt)

<table>
<thead>
<tr>
<th>Country</th>
<th>Delphi method</th>
<th>Meetings within own organization</th>
<th>Meetings with other stakeholders</th>
<th>Offline software</th>
<th>Online solution</th>
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*Comparison of the risk **identification** methods as percentage of respondent by country (HAZARD survey: 108 responses)*
### Risk assessment methods in BSR (2): Analysis and evaluation (excerpt)

*Comparison of the risk **analysis** and **evaluation** methods as percentage of respondent by country (HAZARD survey: 108 responses)*

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Development steps of the toolbox

- Literature review
- Interview study
- Risk categories

Requirements of stakeholders

RA Process and suggested set of methods

Evaluation of applicability

Final set of methods for the toolbox

Toolbox development

Verification and validation
Definition of requirements
Selection of RA methods and risk categories

Comprehensive Literature Review of RA Methods
Hamburg University of Technology

Empirical Interview Study (38 Interviews in BSR)
Estonia (6 Interviews)
Viimsi Municipality
Finland (9 Interviews)
University of Turku
Germany (15 Interviews)
Hamburg University of Technology
Lithuania (8 Interviews)
Vilnius Gediminas Technical University

Risk Analysis and Modelling
PSRA
Evaluation of the RA methods
Cooperation with other EU-Projects

• Strong cooperation with the OpenRisk Project:
  • OpenRisk: Maritime Risk Assessment for Accidental Spills (2017-2018)
  • Selection of mutual applicable methods for risk assessment
  • Participation of WP4 in all OpenRisk workshops
  • Mutual implementation of ISO 31000:2018
HAZARD risk assessment toolbox

RISK ASSESSMENT IN SEAPORTS
Understanding methods and promoting applications with regards to risk assessment (WP leader: Hamburg University of Technology).
READ MORE
HAZARD risk assessment toolbox

HAZARD TOOLBOX

The hazard toolbox is organized as a layered form to be filled out by the user to narrow down the risk assessment methods based on his/her defined criteria including the risk and method type as well as the required effort and complexity of the method.

1. Risk Groups
2. Risk Types
3. Risks
4. Method Properties
5. Complete

Risk Types
- Geophysical
- Hydrological
- Metrological

25%

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HAZARD risk assessment toolbox

RISK ASSESSMENT METHODS

RISK IDENTIFICATION
This section of the webpage enables the user to select the risk assessment methods. These criteria are based on the steps of the risk assessment process according to ISO 31000.

RISK ANALYSIS (CAUSES & THREATS)
RISK ANALYSIS (CONSEQUENCES)
RISK ANALYSIS (LIKELIHOOD)
RISK ANALYSIS (SEVERITY)
RISK EVALUATION

ISO 31000

RISK ASSESSMENT METHODS

RISK IDENTIFICATION
This step demands the organization to identify sources of risk, areas of impacts, their causes and potential consequences. The aim of this step is to generate a comprehensive list of risks that might negatively impact the organization, harm the people and/or the environment. This step should be continuously monitored based on any changes in the environment.

RISK ANALYSIS
This step aims at analyzing the identified risks based on the associated causes and consequences along with their likelihood and severity respectively. Risk analysis provides an input to risk evaluation and to decisions on whether risks need to be treated, and on the most appropriate risk treatment strategies and measures.

RISK EVALUATION
This step aims at the prioritization of the identified risks that have been analyzed in the analysis phase. This is in order to assist in making decisions about the risks that need urgent treatment. Risk evaluation involves comparing the level of risk determined during the analysis process with an established risk criteria.

METHOD PROPERTIES

COMPLEXITY
The application complexity and skills the method demands for the successful usage and application. High complex methods could deliver accurate outcomes and less subjectiveness compared to the less complex methods.

EFFORT
The resources and time effort required to gather all important data for the successful application of the corresponding method. Several methods require more input, which increases the required effort.

METHOD TYPE
Qualitative methods are more subjective but simpler than quantitative methods. Quantitative methods are more resource intensive. Semi-quantitative methods combine the qualitative and quantitative assessment aspects.
Verification and validation of the toolbox
HAZARD risk assessment toolbox

Online link: https://hazard.logu.tuhh.de
References

**Cranfield University (2003)**, Creating Resilient Supply Chain: A Practical Guide, Centre for Logistics and Supply Chain Management, Cranfield, UK: Cranfield University.


Thank you!

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