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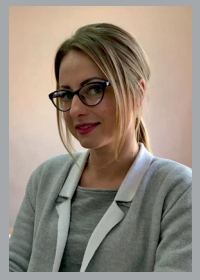

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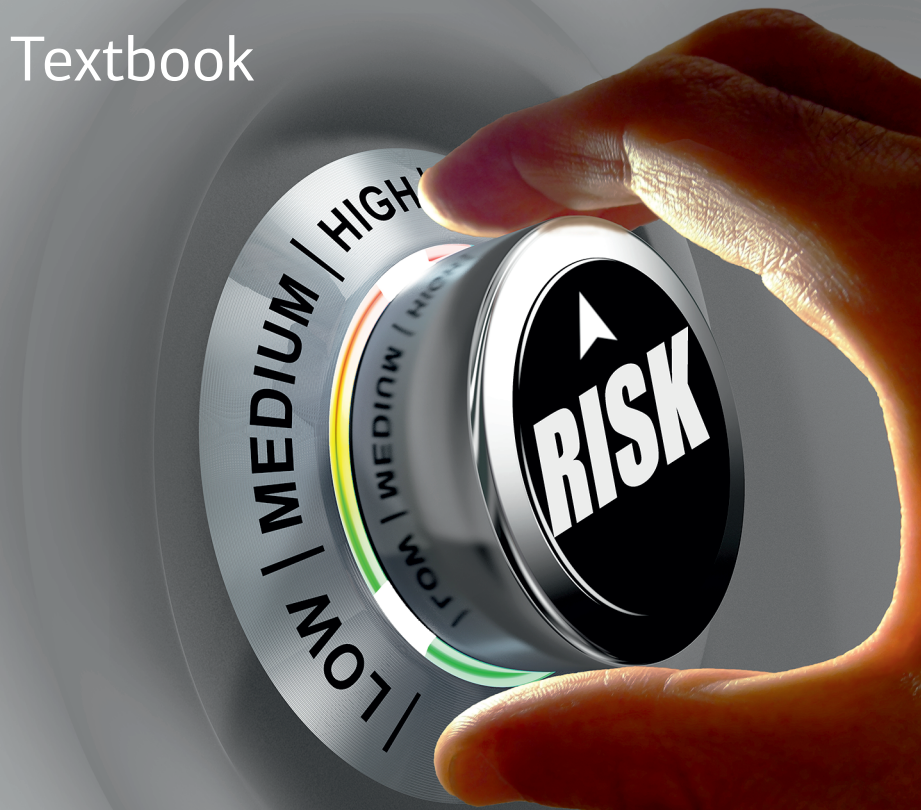
Risk management. Practical lessons & Case Study. Bashynska I., Filyppova S.

BASHYNSKA IRYNA
FILYPPOVA SVITLANA

# RISK MANAGEMENT. PRACTICAL LESSONS & CASE STUDY.

Textbook




Ministry of Education and Science of Ukraine
Odessa National Polytechnic University
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Department of Accounting, Analysis and Audit

BASHYNSKA IRYNA, FILYPPOVA SVITLANA

# RISK MANAGEMENT.
# Practical lessons & Case Study.

Textbook

Odesa
2018

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# INTRODUCTION

*The theory, not tested by experience, with all the beauty of the concept, loses weight is not recognized; a practice that does not rely on a balanced theory, loses and wastes.*

Dmitriy Ivanovich Mendeleev

Unbalance, uncertainty, multicriteria are typical signs of a market economy that is always accompanied by risks. Entrepreneurship and risk are organically interconnected phenomena in a market economy. All activities of an organisation involve risk. Organisations manage risk by anticipating, understanding and deciding whether to modify it.

Throughout this process they communicate and consult with stakeholders and monitor and review the risk and the controls that are modifying the risk.

The task of the textbook:

• training of specialists who are directly prepared for risk research, who should identify risks, assess specific risks, analyse and predict the development of hazardous situations, and, on this basis, formulate recommendations for effective risk management measures for decision-makers;

• training of specialists who are able to understand the results of risk analysis, recommendations arising from modelling of risk situations and use them in their work.

Involving students in active activities allows them to develop practical competences – basic skills, abilities and readiness for action.

The authors of this textbook are scholars and practitioners from Odessa National Polytechnic University, the Department of Accounting, Analysis and Audit:

**Bashynska Iryna**, Ph.D in Economics, Associate Professor, (introduction; T.1 – T.15; annexes);

**Filyppova Svitlana**, Dr. of Economics, Professor, (T.1 – T.15);

**Novak Nadiia**, Senior lecturer, (T. 7);

**Parieva Oleksandra**, Senior lecturer, (T. 12).

The textbook presents both classic problem solving and case studies. Working with a case has its own specifics and suggests the following options for conducting classes:

1. The situation is prepared in advance by the lecturer himself, then the part that is an incident is read out, and then after the listeners ask the questions, each subgroup makes its Solution, and then the right and wrong aspects are discussed in open discussion.

2. The teacher tells the students about the technology of analyzing situations using the "incident" method, then a time of 15 to 20 minutes is given, and each team works out its own version of the situation. When situations for all teams will be developed, then the procedure for collecting information begins: "incident" ("it happened ..."); Questions and answers; Solution-making; presentation of the solution and its analysis by the authors of the situation. Then the other team acts in the same sequence.

The textbook is a practical addition to the textbook: Risk Management. Lecture course by Bashynska I. and Filyppova S. (2017). The textbook contains the results of research according to budget money from the Ministry of Education and Science of Ukraine, given to develop scientific-research topic № 0017U003804 № 711-82 "Risk management of introducing smart metering system in urban passenger transport on the basis of integration of smart innovations, information technologies and marketing tools".

# TOPIC 1.
# Practical lesson 1. Risk Management Basics

*The purpose of the lesson is to study usability of the most frequently used risk models: the risk matrix, the decision tree and bowtie risk assessment.*

Risk is defined as the probability of an event multiplied by its impact or severity. An event may be probable, but with consequences so minimal it would be considered low risk. Conversely, an event that occurs rarely but has severe consequences is considered high risk (like a chemical explosion or equipment-related fatality) [10].

*Common Risk Models*

EHS professionals use a number of risk models for different situations. Three of the models they use most often are the risk matrix, the decision tree and bowtie risk assessment.

**1. Risk Matrix**

The risk matrix is the most commonly used tool in EHS management. It allows you to quantify the risk associated with a hazard, allowing you to set clear guidelines on whether or not the risk is acceptable.

*How it works:* To create a risk matrix, you first break out different levels of probability and impact into verbal scales, assigning each level a numeric value (Table 1).

You then plot the numbers on a matrix or chart, with each square calculated as the product of the corresponding frequency and severity level (Fig. 1).

This allows you to quantify the risk associated with a given hazard.

Each hazard will fall into one of the following areas on a color-coded risk matrix:

Green: Low or generally acceptable risk.

Red: High or generally unacceptable risk.

Yellow: Moderate risk.

*Table 1 – Verbal and Numeric Risk Scales*

| Severity | | |
|---|---|---|
| Verbal | Numeric | Description |
| Catastrophic | 5 | Likely to result in death |
| Critical | 4 | Potential for devere injury |
| Moderate | 3 | Potential for moderate injury |
| Minor | 2 | Potential for minor injury |
| Negligible | 1 | No significant risk of injury |
| | | |
| **Frequency** | | |
| Verbal | Numeric | Description |
| Frequent | 5 | Hazart likelynto occur |
| Probable | 4 | Hazart will be experienced |
| Occasional | 3 | Some manifestations of the hazart are likely to occur |
| Remote | 2 | Manifestations of the hazart are possible, but unlikely |
| Improbable | 1 | Manifestations of the hazart are very unlikely |

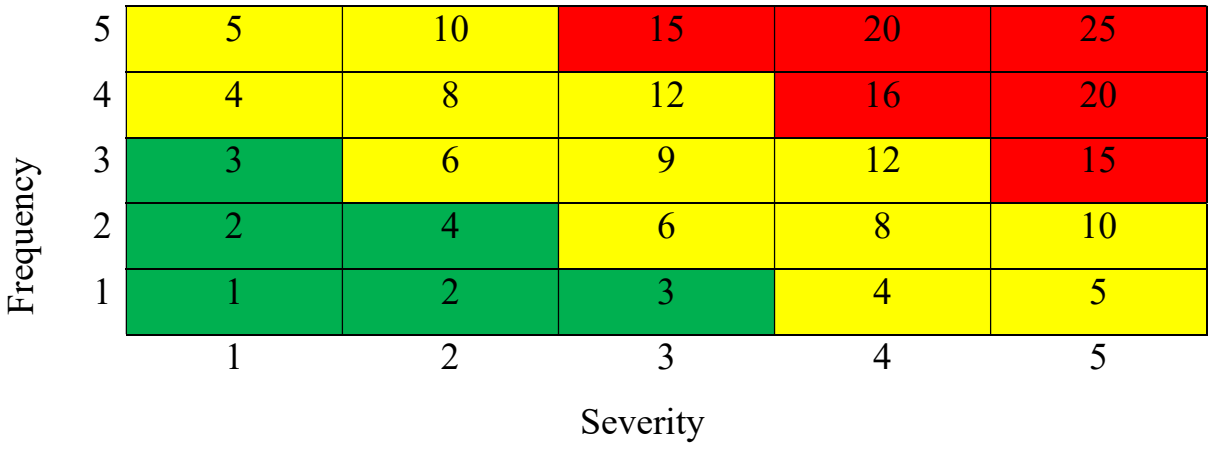


Figure 1 – Risk Matrix

Next, you must interpret the results and decide how to act. This requires your company to:

– Agree on a definition of risk. From CEO to production line workers, everyone must have a common understanding of what defines high and low risk.

– Vet the risk matrix with historical data. By plotting past incidents on the risk matrix, you can pinpoint the division between acceptable and unacceptable risk.

– Create decision-making guidelines. Company policy should dictate the specific number or range that requires new controls to be implemented before proceeding.

**2. Decision Tree**

A decision tree outlines possible decision paths or outcomes for a given situation. Used less often than the risk matrix, it's useful for helping employees know how to apply company policy in a situation that contains many variables.

*How it works:* The decision tree asks a series of questions that lead the reader to a specific action. The decision tree below uses a chemical spill on the shop floor as an example (Fig. 2).

You can use this risk model for many EHS scenarios requiring special procedures, including confined space entry, hazardous material disposal and lockout/tagout (LOTO).

**3. Bowtie Risk Assessment**

Companies use bowtie risk assessment to mitigate the risk of rare but potentially catastrophic events, allowing them to visualize complex risk environments [10].

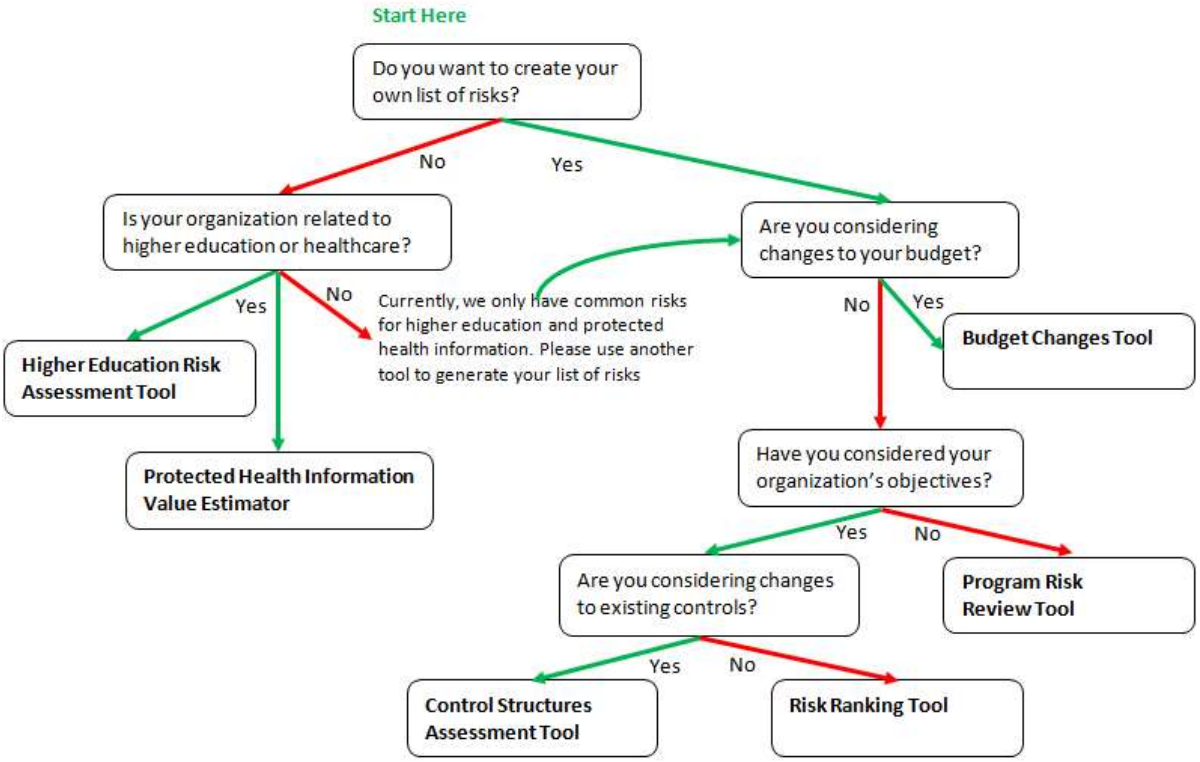


Figure 2 – Risk tool decision tree [20]

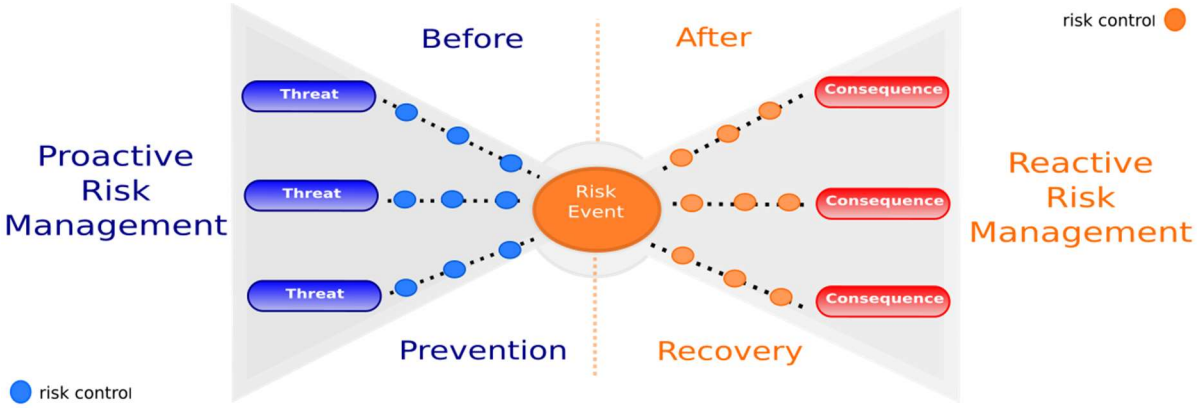


Figure 3 – Bowtie Risk Assessment [10]

*How it works:* The left side of the bowtie model shows preventive controls, which represent barriers to the event. On the right side are recovery controls that would reduce the impact if the event did occur. This detailed threat string outlines

potential pathways through existing barriers to hazard release, and even possibly through reactive barriers.

High-risk industries like oil and gas have long used the bowtie model to reduce the risk of events like oil spills and wellhead blowouts. Other industries are now applying bowtie assessments to their processes as well, especially for loss of control events where companies have little or no historical data to inform risk planning.

**Enterprise Risk Management**

Risk has become a universal language for helping executives make decisions in all operational areas, from quality and safety to finance, security and human resources. EHS Software allows companies to standardize risk management practices across the enterprise, improving consistency in how individuals identify and mitigate risk.

Enterprise Risk Management strategies to focus on include:

- ✓ Centralizing all risk items in a Risk Register. This gives you an easily accessible source for assessing risk across the organization.
- ✓ Establishing risk templates for different types of risk items, including who is responsible and what decision-making criteria are.
- ✓ Creating roll-up reports that show risk across different organizational areas to enable more strategic decision-making.
- ✓ Linking risks in different areas to identify trends and common underlying sources of risk. This can also help EHS teams secure needed investments in risk management initiatives that impact other areas of the organization.

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# Annex 1. Glossary

## GENERAL TERMS

| | |
|---|---|
| **Risk** | Effect of uncertainty on objectives<br>• *An effect is a deviation from the expected; positive or negative;*<br>• *Objectives may have different aspects and can apply at different levels;*<br>• *Often characterised by reference to potential events and consequences or a combination of these;*<br>• *Often expressed in terms of a combination of an event and the associated likelihood of occurrence;*<br>• *Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence or likelihood* |
| **Risk management** | Coordinated activities to direct and control an organisation with regard to risk |
| **Risk management framework** | Set of components that provide the foundations and organisational arrangements for designing, implementing, monitoring, reviewing and continually improving risk management throughout the organisation |
| **Risk management policy** | Statement of the overall intentions and direction of an organisation related to risk management |
| **Risk management process** | Systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context and identifying, analysing, evaluating, treating, monitoring and reviewing risks |
| **Stakeholder** | Person or organisation that can affect, be affected by or perceive themselves to be affected by a decision or activity |
| **Establishing the context** | Defining the external and internal parameters to be taken into account when managing risk, and setting the scope and risk criteria for the risk management policy |
| **Risk assessment** | Overall process of risk identification, risk analysis and risk evaluation |
| **Risk identification** | Process of finding, recognising and describing risks |
| **Risk description** | Structured statement of risk usually containing four elements: sources, events, causes and consequences |
| **Risk source** | Element which alone or in combination has the intrinsic potential to give rise to risk |
| **Event** | Occurrence or change of a particular set of circumstances |

| | |
|---|---|
| | • *An event can be one or more occurrences, and can have several causes;*<br>• *Can consist of something not happening;*<br>• *Can sometimes be referred to as an 'incident' or 'accident';*<br>• *An event without consequences can also be referred to as a 'near miss', 'incident', or 'close call'.* |
| **Hazard** | Source of potential harm |
| **Risk owner** | Person or entity with the accountability and authority to manage a risk |
| **Risk analysis** | Process to comprehend the nature of risk and to determine the level of risk<br>• *Provides the basis for risk evaluation and decisions about risk treatment;*<br>• *Includes risk estimation.* |
| **Likelihood** | Chance of something happening In risk management terminology, likelihood is used to refer to the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as probability or a frequency over a given time period) |
| **Consequence** | Outcome of an event affecting objectives<br>• *An event can lead to a range of consequences;*<br>• *A consequence can be certain or uncertain and can have positive or negatives effects on objectives;*<br>• *Consequences can be expressed qualitatively or quantitatively;*<br>• *Initial consequences can escalate through knock-on effects.* |
| **Risk matrix** | Tool for ranking and displaying risks by defining ranges for consequence and likelihood |
| **Level of risk** | Magnitude of a risk or combination of risks expressed in terms of their consequences and their likelihood. Also known as the risk rating. |
| **Risk evaluation** | Process of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable |
| **Risk attitude** | Organisation's approach to assess and eventually pursue, retain, take or turn away from risk |
| **Risk appetite** | Amount and type of risk that an organisation is willing to pursue or retain |
| **Risk tolerance** | Organisation's or stakeholder's readiness to bear the risk after risk treatment in order to achieve its objectives |
| **Risk acceptance** | Informed decision to take a particular risk |

| | |
|---|---|
| | • *Acceptance can occur without risk treatment or during the process of treatment*<br>• *Accepted risks are subject to monitoring and review* |
| **Risk treatment** | Process to modify risk<br>• *Avoid the risk by deciding not to start or continue with an activity that gives rise to the risk;*<br>• *Take or increase risk in order to pursue an opportunity;*<br>• *Remove the risk source;*<br>• *Change the likelihood;*<br>• *Change the consequence;*<br>• *Share the risk with another party or parties (including contracts and risk financing);*<br>• *Retain the risk by informed decision* |
| **Control** | Measure that is modifying the risk<br>• *Controls include any process, policy, device, practice, or other actions which modify risk;*<br>• *Controls may not always exert the intended or assumed modifying effect.* |
| **Residual risk** | Risk remaining after risk treatment<br>• *Residual risk can contain unidentified risk;*<br>• *Also known as 'retained risk'.* |
| **Resilience** | Adaptive capacity of an organisation in a complex and changing environment |
| **Monitoring** | Continual checking, supervising, critically observing or determining the status in order to identify change from the performance level required or expected |
| **Review** | Activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives |
| **Risk reporting** | Form of communication intended to inform particular internal or external stakeholders by providing information regarding the current state of risk and its management |
| **Risk register** | Record of information about identified risks |
| **Risk profile** | Description of any set of risks |

# Annex 2. Risk message checklist

INFORMATION ABOUT THE NATURE OF RISKS

1. What are the hazards of concern?
2. What is the probability of exposure to each hazard?
3. What is the distribution of exposure?
4. What is the probability of each type of harm from a given exposure to each hazard?
5. What are the sensitivities of different populations to each hazard?
6. How do exposures interact with exposures to other hazards?
7. What are the qualities of the hazard?
8. What is the total population risk?

INFORMATION ABOUT THE NATURE OF BENEFITS

1. What are the benefits associated with the hazard?
2. What is the probability that the projected benefit will actually follow the activity in question?
3. What are the qualities of the benefits?
4. Who benefits and in what ways?
5. How many people benefit and how long do benefits last?
6. Which groups get a disproportionate share of the benefits?
7. What is the total benefit?

INFORMATION ON ALTERNATIVES

1. What are the alternatives to the hazard in question?
2. What is the effectiveness of each alternative?
3. What are the risks and benefits of alternative actions and of not acting?
4. What are the costs and benefits of each alternative and how are they distributed?

UNCERTAINTIES IN KNOWLEDGE ABOUT RISKS

1. What are the weaknesses of available data?
2. What are the assumptions on which estimates are based?
3. How sensitive are the estimates to changes in assumptions?
4. How sensitive is the decision to changes in the estimates?
5. What other risk and risk control assessments have been made and why are they different from those now being offered?

INFORMATION ON MANAGEMENT

1. Who is responsible for the decision?
2. What issues have legal importance?
3. What constrains the decision?
4. What resources are available?

# Annex 3. A consumer's guide to risk and risk communication

WHAT IS RISK?
Key Terminology and Concepts
Hazard, exposure, probability, sensitivity, individual risk, population risk, distribution of risk, unattainability of zero risk
Qualitative Attributes
Voluntariness, catastrophic potential, dreadedness, lethality, controllability, familiarity, latency

WHAT DOES RISK ASSESSMENT CONTRIBUTE?
Quantification
Quality, completeness, uncertainty, confidence
Scientific and Policy Inferences
Assumptions, assessment of benefits, risk management choices

WHAT IS THE ROLE OF THE RISK COMMUNICATION PROCESS?
Setting
Public debate about decisions, informing or influencing personal action
Purpose
Messages can inform, influence, or deceive
Interaction Among Participants
Contending conclusions, justifications, credibility, and records

HOW CAN YOU FIND OUT WHAT YOU NEED TO KNOW?
Technical Content
Demystifying jargon, comparing relevant risks, finding trusted interpreters
Independent Sources
Information clearinghouses, academic or public service sources

HOW CAN YOU PARTICIPATE EFFECTIVELY?
Finding the Right Arena
Identifying the responsible decision maker, getting on the agenda
Intervention
Identifying points and times for intervention, marshalling support

HOW CAN YOU EVALUATE THE MESSAGES AND THE COMMUNICATORS?
Accuracy
Factual base, track record, consistency, self-serving framing, use of influence techniques, misleading risk comparisons
Legitimacy
Standing, access, review, due process justification
Interpreting Advocacy
Comparing competing arguments, seeing where information has been omitted, questioning message sources

# Annex 4. Risk register form

Date of preparation: _____

| Risk description | Consequences of risk realization | Damage from risk | Risk probability | Risk assessment | Risk reduction measures | Responsibility and deadlines |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# Annex 5. List of risk management research associations

Here is a list of major associations in the world involved in risk management research focusing on various aspects of risk.

AIRMIC (Association of Insurance & Risk Managers) - Insurance - www.airmic.com

ARIA (American Risk & Insurance Association) - Insurance - www.aria.org

ASSE (American Society of Safety Engineers) - Security - www.asse.org

CAS (Casualty Actuarial Society) - Insurance - www.casact.org

CIRANO (Center Interuniversitaire de Recherche en Analyze des Organisations) - www.cirano.qc.ca

FERMA (Federation of European Risk Management Associations) - insurance - www.ferma-asso.org; Also affiliated with IFRIMA (International Federation of Risk and Insurance Management Associations)

FEI (Financial Executives Institute) - Finance - www.fei.org

GARP (Global Association of Risk Professionals) - Global Finance - www.garp.com

IIA (Institute of Internal Auditors) - Audit / Control, Management - www.theiia.org

IRM (Institute of Risk Management) - Global Insurance - www.theirm.org

NACD (National Association of Corporate Directors) - Management - www.nacdonline.org

PRIMA (Public Risk Management Association) - Insurance - www.primacentral.org

PRMIA (Professional Risk Manager's International Association) - Global Finance - www.prmia.org

RAPA (Risk Assessment & Policy Association) - Global Public Policy (Public Policy) - www.piercelaw.edu/risk/rapa.htm

RIMA (Risk Management Institution of Australia) - Lending

RMA (Risk Management Association) - Lending - www.rims.org

RIMS (Risk & Insurance Management Society) - Insurance - www.rims.org

SRA (Society for Risk Analysis) - Global Public (Public) Policy - www.sra.org

Notes

Notes

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