

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

NATIONAL TECHNICAL UNIVERSITY
«KHARKIV POLYTECHNIC INSTITUTE»

METHODOLOGICAL GUIDELINES
for the practical classes
in the discipline “Riskology”
for students in the specialty D3 “Management”

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INTRODUCTION

Riskology course aims to equip students with the knowledge and skills to identify, assess, and manage risks in organizational and project contexts, ensuring informed decision-making and sustainable business performance. The course objectives are that by the end of the course, students will be able to understand and identify the main types of risks in the business environment, develop and implement risk management strategies and tactics, select and evaluate appropriate organizational and economic methods for managing risks.

Practical training is an essential component of managerial education. It enables students to transform theoretical knowledge into professional competencies. Through solving practical tasks, analyzing business cases, and applying analytical methods, future managers develop the ability to evaluate complex situations, justify managerial decisions, and respond effectively to changing organizational conditions. Practical classes also contribute to the development of problem-solving, communication, and critical-thinking skills that are necessary for successful professional activity in modern organizations.

The practical part of the course consists of 8 topics related to the practical aspects of identifying, measuring risks, as well as making managerial decisions aimed at minimization of their negative impact in business environment:

Topic 1. Identifying risks in business situations

Topic 2. Classification of business risks

Topic 3. Risk analysis using risk matrices

Topic 4. Selecting risk management methods

Topic 5. Risk measurement and basic indicators

Topic 6. Decision-making under uncertainty

Topic 7. Functional risks in enterprise activities

Topic 8. Integrated risk management

STRUCTURE AND TASKS FOR THE PRACTICAL CLASSES

Topic 1. Identifying Risks in Business Situations

Practical understanding of risk vs. uncertainty. Identification of risks in simple business cases. Internal and external risk mapping. Group discussion of risk sources

Objective: to analyze business scenarios, identify risks and classify them.

Task: Read the provided business scenarios. For each scenario, list 10 factors that may influence the outcome of the situation. Classify each factor as either a risk with measurable probability or uncertainty (non-measurable). Identify internal and external factors. Create a table (see Table 1) showing internal and external risk sources.

Table 1 – Risks identification form

Factor	Type (risk or uncertainty)	Internal or external	Source
1.			
2.			
3.			
4.			
5.			
...			

Work in small groups to compare and refine your results. Discuss in your group which risks are most critical for management and why. Present a short summary to the audience.

Scenario 1. A group of entrepreneurs plans to open a small cafe in a city center of Prague. The cafe will offer coffee and pastries. The founders have limited experience in the food service industry and rely on a bank loan for initial financing. Several other cafes already operate nearby, and consumer preferences for healthy and sustainable products are increasing. Local authorities recently announced possible changes in sanitary regulations.

Scenario 2. A medium-sized French clothing company that previously (for 40 years) have been selling products only in physical stores decides to finally launch an online store. The company plans to invest in a new website, digital marketing, and a delivery system. The owners and the management team are uncertain about customer demand for online shopping, cybersecurity threats, logistics reliability, and future changes in digital advertising.

Scenario 3. A technology startup from Ukraine is developing a wearable heart-monitoring device. The product uses new sensor technology and AI-based analytics. The company plans to enter international markets within one year. Competitors are working on similar devices, and regulatory approval is required in each target country. The startup depends on venture capital funding and partnerships with healthcare providers.

Topic 2. Classification of Business Risks

Categorization of identified risks. Strategic, operational, financial, compliance, reputational risks. Pure vs. speculative risks. Business case analysis on types of business risks.

Objective: To learn how to classify risks based on their features and situation in the company's environment.

Task: The following list of risks is defined for a large manufacturing company operating in the consumer electronics industry, producing devices such as smartphones, tablets, and smart home equipment.

The company operates in a highly competitive and technology-driven market, relies on global supply chains, and is exposed to rapid technological change, regulatory requirements, and quickly changing consumer demand. The company is one of the leaders of the market globally.

Review the list of risks provided in Table 2. Classify each risk as strategic, operational, financial, compliance, or reputational. Classify each risk as pure or speculative. Be prepared to explain your classification choices. For each risk, describe possible outcomes (loss only or loss/gain).

Table 2 – Risks of an electronics manufacturer

Risk	Type	Pure or speculative	Possible outcomes
Supply chain disruption due to shortages of electronic components			
Dependence on a single key supplier for critical microchips			
Production equipment breakdown and downtime			
Quality defects leading to product recalls			
Cybersecurity breaches in production systems			
Intellectual property theft or industrial espionage			
Rapid technological obsolescence of products			
Failure of a new product launch in the market			
Price changes of raw materials (for example, metals, rare earth elements)			
Exchange rate fluctuations affecting import costs			
Non-compliance with international safety and certification standards			
Changes in environmental regulations affecting production processes			
Reputational damage due to labor or environmental scandals			
Negative consumer reviews in social media			
Market demand decline due to economic recession			
Aggressive competition from low-cost manufacturers			
Internal fraud or corruption in procurement			
Loss of key engineering personnel			
Failure of R&D projects to deliver viable innovations			
Logistics disruptions in international distribution channels			

Topic 3. Risk Analysis Using Risk Matrices

Probability-impact assessment. Construction of simple risk matrices.

Prioritization of risks. Interpretation of heat maps for managerial decisions

Objective: Learn about using risk matrices for risk analysis.

Task: Read the business case, select 5-8 risks from it. Assign a probability level (Very likely, Likely, Possible, Unlikely, Very unlikely) and an impact level (Very low, Low, Moderate, High, Severe) to each risk.

Plot the risks on a risk matrix (heat map), based on the template in Table 3.

Table 3 – Risk matrix template

		Impact →				
		Very low	Low	Moderate	High	Severe
Likelihood →	Very likely					
	Likely					
	Possible					
	Unlikely					
	Very unlikely					

Identify high-priority risks based on their position in the matrix. Explain which risks require immediate managerial attention and why.

Discuss if the color coding of the matrix cells requires any modifications for the specific case.

Business case:

A mid-sized guitar manufacturing company produces acoustic and electric guitars in USA and has a strong reputation in its domestic market. The company uses a mix of automated CNC machining and handcrafted finishing. It positions its products in the mid-to-premium price segment (\$750-1500 per instrument). The company plans to enter the European market within the next 18 months due to growing demand for musical instruments.

To support market entry, the company plans to establish a regional distribution network, partner with local music retailers, and launch digital marketing campaigns. Management is considering whether to set up local assembly facilities or export finished products from its existing factory. The company also plans to adapt product

designs to local preferences, including materials and culturally influenced aesthetics (for example, no designs typical for country music).

However, the company faces several uncertainties and risks. Market demand in the target region is not fully predictable, and consumer brand awareness is low. Local retailers offer comparable low-cost instruments produced in Asia, which may pressure pricing and margins. Exchange rate fluctuations can affect export profitability. Regulatory requirements for imported musical instruments, including certification and customs procedures, may delay market entry. Supply chain disruptions can occur due to long-distance logistics and potential geopolitical tensions. Intellectual property risks exist due to possible similarities in designs. Cultural differences in marketing communication and distribution practices may reduce the effectiveness of promotional strategies. Additionally, the company must decide on the level of investment and financing structure.

Topic 4. Selecting Risk Management Methods

Matching risks with appropriate treatment methods. Avoidance, reduction, transfer, acceptance. Cost–benefit logic in risk treatment. Decision-making exercises.

Objective: Explore risk management methods and find their preferred use cases.

Task: List all identified risks from the previous task. For each risk, select an appropriate management method: avoidance, reduction, transfer, or acceptance. Explain your choice in terms of management theory. For at least two risks, propose alternative treatment options.

Propose specific actions to implement the method. For example, for the risk of transportation damage, select risk transfer and propose insurance as a solution. Estimate approximately the possible costs and/or benefits related to each risk (Table 4).

Table 4 – Risk management methods selection template

Risk	Method	Specific actions to implement the method	Costs	Benefits
1.				
2.				
3.				
...				

Discuss two strategic options: exporting finished guitars or establishing local assembly facilities in EU. Identify at least three additional risks for each option. For each risk, propose a management method. Compare the risk profiles of the two strategies and recommend the less risky option.

Topic 5. Risk Measurement and Basic Indicators

Estimating expected loss. Use of quantitative indicators. Ranking risks using scores and thresholds. Discussion of measurement limitations. Decision trees

Objective: Learning the basics of using risk-related indicators.

Task: Work in small groups. Read the business case, calculate the expected loss for each of the risks mentioned, rank risks according to their severity. Build a decision tree and decide, what is the most favorable decision.

Business case:

Coulomb Motors is a mid-sized electric vehicle manufacturer based in Europe. The company produces compact electric cars for urban markets and has stable sales in its domestic market. Management plans to expand into a new Central Asian market by launching a new compact EV model within 2 years.

The expansion project requires investment in marketing, local distribution, charging partnerships, and partial localization of assembly. Demand in the target market is uncertain, and several strategic and operational risks are identified:

Risk 1. Lower-than-expected market demand. Probability (P_1) = 0.30, potential loss (L_1) = 5 000 000 € due to unsold inventory, not covered costs.

Risk 2. Depreciation of local currency. Probability (P_2) = 0.25, potential loss (L_2) = 2 000 000 € due to reduced profit margins.

Risk 3. Regulatory delay in vehicle certification. Probability (P_3) = 0.15, potential loss (L_3) = 1 200 000 € because of delayed sales, storage costs.

Risk 4. Battery supply disruption. Probability (P_4) = 0.10, potential loss (L_4) = 3 500 000 € because of production downtime and penalties.

Risk 5. Reputation risk due to quality issues in early units. Probability (P_5) = 0.05, potential loss (L_5) = 4 000 000 € due to defective units recall costs and brand damage.

Perform calculations using the following formulas:

$$Expected\ Loss_i = P_i \times L_i$$

$$Total\ Expected\ Loss = \sum (P_i \times L_i)$$

Rank the risks based on the obtained results.

Coulomb Motors also must choose one of three alternative strategies to enter the new market:

A) Build local assembly plant with initial investment cost of 20 000 000 €

B) Export finished vehicles from Europe with initial investment cost of 5 000 000 €

C) Do not enter the market at all, at 0 €

The demand estimates are shown in Table 5.

Table 5 – Demand estimates for Coulomb Motors' new market

Market demand level	Probability
High demand	0.40
Medium demand	0.35
Low demand	0.25

Financial payoffs for each alternative (before subtracting initial investment) are shown in Table 6.

Table 6 – Financial payoffs for the 2 years, €

Alternative	High demand	Medium demand	Low demand
A	35 000 000	15 000 000	-10 000 000
B	12 000 000	6 000 000	-2 000 000
C	0	0	0

Draw a decision tree with three decision branches (A, B, C). Add chance nodes for demand levels with given probabilities. Insert net payoffs at the end of each branch:

$$\text{Net Payoff} = \text{Profit} - \text{Initial Investment}$$

Calculate expected monetary value (EMV) for each alternative:

$$EMV = \sum (\text{Probability}_i \times \text{Net Payoff}_i)$$

Compare EMVs and identify the financially optimal strategy. Discuss how risk tolerance, strategic goals, and sustainability considerations could change the final managerial decision.

Bonus task: Discuss how it is possible to expand and enhance the real-life investment risk calculations using the discounting of cash flows.

Topic. 6. Decision-making under Uncertainty

Probability of risk. Maximin, minimax, maximax, minimax regret criteria, Laplace criterion, Hurwicz criterion. Behavioral aspects in risk decisions.

Objective: Learn how to apply the common decision criteria for situations under uncertainty.

Task: For each of the following payoff tables (Tables 7–11) apply the studied criteria: Maximax (optimistic), Maximin (pessimistic), construct regret matrix and apply Minimax Regret, Laplace criterion (equal probabilities), Hurwicz criterion ($\alpha = 0.6$). Make conclusions about each case.

Table 7 – Payoff table. High-risk market entry strategy, million €.

Alternative	Very high demand	High demand	Low demand	Very low demand
Aggressive expansion	60	40	-20	-35
Moderate expansion	45	30	10	-15
Pilot launch	25	18	12	5
No entry	0	0	0	0

Table 8 – Payoff table. Technology investment decision, million €.

Alternative	Tech boom	Stable growth	Slow growth	Decline
Full automation	70	35	-15	-40
Partial automation	40	25	5	-10
Manual production	20	15	10	2
No investment	0	0	0	0

Table 9 – Payoff table. New product launch strategy, million €.

Alternative	Product hit	Average success	Low sales	Product failure
Mass production	55	25	-10	-30
Limited production	30	20	8	-5
Prototype only	15	12	6	1
Cancel project	0	0	0	0

Table 10 – Payoff table. International market expansion, million €.

Alternative	Strong demand	Moderate demand	Weak demand	Market failure
Build foreign plant	80	50	-30	-60
Export only	35	25	5	-5
Licensing	20	18	12	6
Stay domestic	0	0	0	0

Table 11 – Payoff table. Supply chain strategy choice, million €.

Alternative	Stable supply	Minor disruptions	Major disruptions	Supply collapse
Single global supplier	40	20	-20	-50
Dual global sourcing	30	22	5	-10
Local suppliers	20	18	12	8
Vertical integration	35	28	10	-5

Topic 7. Functional Risks in Enterprise Activities

Risk identification across business functions. Linking risks to departments and processes. Risk ownership and responsibility.

Objective: Learn the connection between different risks and the functional areas of a company.

Task: Identify, classify, and analyze risks arising in different functional areas of the company described below and assign risk ownership to specific departments (production department, procurement and supply chain department, quality assurance and food safety department, marketing department, sales department, research and development department, finance department, human resources department, legal and compliance department, IT and digital systems department).

Business case:

DniproSnack LLC is a medium-sized Ukrainian company specializing in the production of potato chips and other snack products. The company operates a production plant in central Ukraine and supplies products to national supermarket chains, regional distributors, and small retail stores. Raw materials (potatoes, vegetable oil, flavorings, packaging materials) are sourced from domestic agricultural producers and foreign suppliers.

The company operates in a highly competitive fast-moving consumer goods (FMCG) market with strong international brands and private labels. Demand is seasonal and sensitive to price, consumer trends, and promotional campaigns. The company plans to expand its product portfolio with healthier snack options (baked chips, low-salt products) and increase exports to neighboring countries.

The company faces multiple functional risks across its operations. These include war-related risk of destruction of facilities, issues with electricity, variability in potato yields due to weather conditions, potential increase of energy and logistics costs, quality and safety risks in food production, changing consumer preferences, regulatory requirements in food safety and labeling, and reputational risks related to negative media coverage.

Topic 8. Integrated Risk Management

Identification of sustainability-related risks in business cases. Qualitative assessment of ESG risks using risk matrices

Objective: develop skills of identification of sustainability-related risks in real-life business situations.

Task: Select one large international corporation (e.g., in manufacturing, energy, FMCG, automotive, technology). Find the company's official Sustainability Report, ESG Report, or Integrated Annual Report on its corporate website.

Identify and extract information about key sustainability-related risks, focusing on: environmental risks (climate change, emissions, water use, waste, resource scarcity), social risks (labor conditions, human rights, supply chain ethics, community impact), and governance risks (corruption, compliance, data privacy, board structure).

For each identified risk, analyze source of the risk, potential impact on the company (financial, operational, reputational, regulatory), stakeholders affected (investors, employees, customers, regulators, communities).

Identify risk management and sustainability strategies described in the report.

Evaluate how sustainability risks are integrated into the company's overall risk management system.

RECOMMENDED LITERATURE

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