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MEvAR - AN INNOVATIVE METHODOLOGY OF MANAGEMENT OF PROFESSIONAL ASSESSMENTS

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Abstract: *The paper aims to present a study on the opportunity and feasibility to apply the MEvAR management methodology of occupational risk assessment. The MEvAR methodology creatively guarantees that the requirements of the management system and the OS&H regulations are addressed while also identifying and evaluating the key components of occupational risk assessment. The basic elements of the methodology, the structure, the mathematical model, an updated list of risk factors, calculation grids and comparisons with the main methodologies used in Romania are presented to highlight the main advantages. The results of the study provide the necessary requirement for occupational risk assessment management methodology that can be easily used by specialists and managers.*

Key words: *MEvAR, OS&H management system, assessment, occupational risk, field of application*

1. INTRODUCTION

The necessity to modernize and enhance the currently employed professional evaluation procedures led to the development of the MEvAR methodology. Each field of activity uses its own methodologies for risk assessment. Thus, there are models or methods of risk analysis and assessment in the financial, occupational, emergency, security, social, political and other fields.

These models have in common the way of calculating the risk according to probability, exposure, gravity, impact but they do not have correspondences.

For this reason, we wanted to ensure interoperability between the input and output data of the processes, including the occupational or OS&H field ones.

The need to update and correlate the results has a direct impact on the management of the organizations and on the communications between the evaluation specialists with it.

2. STUDY ON MEvAR METHODOLOGY

2.1 Study design

The paper serves as a strategy for the study by providing a brief explanation of the technique and a comparison between the MEvAR methodology and other approaches utilized in Romania.

The structure, calculation model, calculation grids, calculation sheets, and formulae utilised, the way risks are handled, the suggested preventive and protective measures, the forms that are obtained, and the outcomes are all described in detail in the MEvAR methodology. The key components of various approaches were recognized and presented in the study, and the primary factors that should be considered were emphasized through comparisons.

2.2. MEvAR methodology description

The MEvAR (**M**anagement of **Ev**aluation and **A**ssessment of **R**isks in Romanian) methodology is developed by a team of specialists in the field of occupational health and safety at National University of Science and Technology POLITEHNICA Bucharest and specialists from the private sector who have adapted the technical requirements of occupational risk assessment methodologies to

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current legal and management system requirements.

MEvAR methodology has been previously presented in conferences and specialized articles as methodology but a correction is needed in the name and content because it is easier to accept as a methodology than a method.

The main purpose of the methodology is to adapt the legal requirements and those of the management system to the professional risk assessment methodologies in order to integrate the systems, activities to ensure the safety and health of workers through the direct involvement in the process of the management of the evaluated organizations.

The methodology is intended for technical occupational risk assessment specialists and managers of private or governmental organizations from a managerial and administrative perspective to assessing the level of occupational risk in the organization, the treatment and prevention and protection measures necessary to mitigate risks, monitoring and recording of control measures and continuous improvement of work processes.

Considering the approach is based on an overlap between the two technical occupational risk assessment methodologies that are utilized, as well as the managerial and technical involvement of the management system and regulatory requirements, it may be used to all domains of activity. The technique solely applies to the two comparable evaluation methodologies if the prerequisites are not met. The following components of the MEvAR methodology are presented in the context of the requirement change for OH&S management systems by SR EN ISO 45001:2018 and the requirement to adopt an assessment and evaluation methodology of occupational risks that is tailored to the current requirements: [1], [14]

- it has correspondence in the Community or international standards in the field.
- the methodology considers elements of certainty before risks, risks are aggregated since sources, dangerous situations and hazards, elements specific to the organization, work teams, workers, direct relationship with the organization’s management, company management and workplace managers, records and history of impact on workers.
- The investigation examines at the organization's workstation, activities, processes, sensitive groups, work equipment, use of chemicals and/or preparations, and workspace setup.
- risks generated in the analysis and action, opportunities, vulnerabilities and capabilities are considered.
- Technical information, operational factors, and current maintenance records are examined to predict equipment failures.
- To improve investigation of external sources and affects, the work environment has been separated into the surrounding environment and the actual workplace.
- risks associated with combining and modifying the key components of SR EN ISO 31010:2019, SR EN ISO 45001:2018 are analyzed and evaluated using various assessment methodologies (Brainstorming, Delphi, Heinrich, FMEA, AMDEC, ARAMIS, ISHIKAWA, NEBOSH, HAZOP, ELVIE, REASON, INCDPM Bucharest, MEVA, etc.) taking into account the involvement of a minimum of two assessors, analysis and identification of sources, interviews, supervision, and process meeting arrangements; the assessed values employ parameter-specific mathematical models, various types 5x5, 4x4, and 3x3 with associated values selected by the assessor to realize the significance of the risk and suggested remedies [1], [7].
- Risks can be evaluated in a variety of ways, including initial, proposed, residual, and weighted using fundamental approaches in accordance with predetermined goals and purposes. Risk treatment strategies can be chosen, and risks can be reassessed as they are being evaluated.
- The approach combines the requirements of the OH&S management system, contemporary legal requirements, and harmonized components of traditional occupational risk assessment methodologies.
- The degree of injury is a ratio of trauma to disease, and the amount of material damage is calculated based on the organization's financial

standing. Severity is defined as the ratio of consequence to harm.
- Probability is examined in terms of the possibility that an event will transpire as well as the exposure's parameters, including its path, duration, and frequency.
- The assessment considers both the quantity and caliber of employees.
- The frequently accessed Microsoft Excel software program, which is used to generate reports on the certainties and potential risks, their treatment options, and preventive and protective measures in the OH&S domain, has been thought to make the methodology comparatively simple to use.

Table 1 [1], [14]

MEvAR method SWOT analysis

INTERNAL ENVIRONMENT		
Updated method according to RS-EN-ISO-45001:2018 It combines elements from the most adapted methods Keep track of and analyze the organization's management It assumes low computing resources and funds Perform risk aggregation and treatment It redefines the organization's priorities and responsibilities	**SWOT ANALYSIS - MEvAR Methodology**	Implementing a management system in part Lacking comprehension of the procedure A substantial quantity of records The evaluation is primarily subjective. Limited professional experience
STRENGHT		**WEAKNESSES**
OPPORTUNITIES		**THREATS**
News on complex risk assessment Adaptable and easy to implement Quick and practical tool for evaluators Can be developed/integrated into automated software applications Ease of understanding of the principle of the method by managers Facilitating the establishment of the level of accepted and tolerateded risk		Ineffective promotion Competition Activity Reluctance to adopt a new method Distinction between strict compliance with legal requirements and the organization's objectives Appreciation of classical methods in contrast with the application of general risk assessment methods
EXTERNAL ENVIRONMENT		

The MEvAR methodology's stages of occupational risk assessment consider the following: [1], [13], and [14].

a. Making certain the requirements for the assessment
b. Recognizing, evaluating, and analyzing risks and hazardous circumstances
c. Outlining the risks and certainties
d. Evaluation of occupational risks
e. Drafting the report on the risk assessment
f. Developing the risk assessment report's accompanying documentation.
g. Managing the risk assessment documentation's receipt

Details:

a. Making sure the conditions are met for conducting the occupational risk assessment is part of making sure the prerequisites for the assessment are met.

The contractual requirements consider:
- implementing a contractual agreement between the evaluator team and the evaluation's beneficiary
-making sure that the contractual relationships with the vendors, partners, and actual or legal participants in the assessment are maintained
-maintaining the contractual relationships with the organization's personnel

Administrative specifications are related to:
- the organizational structure and the interaction between personnel and structures
- choices about the structure and operation of the company, as well as its procedures and roles
- access to equipment, facilities, and jobs
- cooperation and/or coordination with institutions, beneficiaries, suppliers, neighbors, civil society, and other stakeholders

Ensuring that the **organization complies with labor code, social responsibility, employment, work procedures, technology, occupational safety and health,** emergencies, environmental protection, etc. is the goal of legislative compliance information**.** Before realizing the risks, it is necessary to have a thorough understanding of work processes to structure the procedure, monitor the production flow, and identify any interference. The staff and team members with whom the risk assessment will interact will have their work schedules determined and the activities will be scheduled before the activity begins.

The head of the evaluation team, or another person chosen by the evaluators, will be responsible for providing **the participating staff with information and training.** This will involve, among other things, communicating the names and roles of each participant, their relationship, their tasks, and any necessary risks.

The organization's employees or its contracted suppliers **will prepare the beneficiary's installations, equipment, and documentation for review.**

After receiving visitor training and having the appropriate personal protective equipment tailored to the hazards, access authorizations in front of **the workplace manager will be required before entering any workplace** that is subject to assessment.

b. Hazards and dangerous situations will be identified, analyzed, and assessed with checklists, verification, direct observation, documentation, interviews, determinations, and other methods. Documented information will also be ensured. [1, 2],[3]

c. Through on-the-spot assessment, interaction with other specialists, and/or comparison with checklists unique to the evaluation process, the evaluators ensure the formation of certainties and dangers. [2], [14]

d. The working tool in the application is used for **the occupational risk assessment, which comprises the following:**

- implementing the information into the program
- reviewing, ascertaining, and approximating the degrees of risk computation components
- the application's computation of the approximate risk
- the design of the residual risk that results from the recalculation of the analysis of the risk treatment, the application's verification of the assurance of the preventative and protective measures, and continual improvement that is intended to be accomplished by adding fresh data

e. The application must be prepared and printed in a format that is acceptable for the **risk assessment report to be completed.**

f. The application creates the risk evaluation report's attached papers, which in theory consist of the following reports and documents:

- a plan for safety and prevention
- risk register.
- assessment forms for employment tools; - chemicals or hazardous materials.
- work plans ergonomics and delicate groupings- certainties (certain dangers), unacceptable risks and acceptable risks
- specific forms (risk alert form and risk tracking sheet)
- graphics and other useful data

g. The risk assessment activity is finished when the **risk assessment paperwork** is turned in and signed by all involved parties.

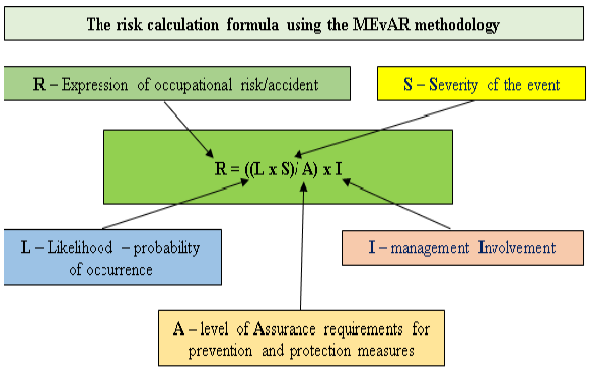

Fig. 1 MEvAR computing formula (from authors)

The level of identified and residual risks is assessed by applying the results of the risk calculation to Fuzzy logic, ensuring the correlation of Fuzzy linguistic variables with numerical values, risk aggregation being in the experimental phase. The weighted arithmetic mean of the identified risk values is used to determine the organization's average risk level.

By combining the risks and using a matching risk correction factor, assessment sheets for work equipment, hazardous materials or chemicals, sensitive groups, and the job description sheet are included in the computation. To finish them, the special valuation techniques on the forms must be used, and the resulting data must be converted into input elements for the risk calculation of the MEvAR methodology. Proposals for enhancing the organization's goals, opportunities, and performance may be made after the evaluation.
The general guidelines that apply to preventive and safety measures for the removal, avoidance, transfer, treatment, monitoring, and risk control methods are included in the risk handling table.

2.3. Comparison between methodologies

For the proposed analysis, it is necessary to make a comparison between the methodologies, each methodology presents positive aspects and aspects that require special attention or updating.
For this reason, we have proposed the new methodology that takes the useful elements from the main methodologies currently used.

Identified risks are assessed by different methodologies and compared with MEvAR to provide an additional reference.
The main methods studied are:
- Study of hazards and operability: This refers to the methodical identification of risks in the design of a process plant.
- Fault tree analysis: This technique for potentially quantitative risk analysis examines the specifics of contributors to the most bothersome events.
- Event tree analysis: To perhaps apply quantitative techniques to examine the intricacies of how significant undesirable events develop.
- What-if examination: What-if inquiries concern potential problems and potential outcomes if something goes wrong.
- Analysis of failure mode and effect (FMEA): It is employed to detect probable malfunctions and ascertain the consequences that such malfunctions may cause.
- NEBOSH: job analysis and prioritization of risk management measures.
- INCDPM Bucharest: a priori risk analysis is used especially in Romania.

Table 2.

Comparative information on methods used to assess potentially hazardous substances and preparations.

The occupational risk assessment approach most frequently applied in the Romanian companies under evaluation (INCDPM) [1]	**NEBOSH Methodology**	**Methodology MEvAR**[1]
The methodology is known and applied by most occupational risk assessors	The methodology is known and applied by most occupational risk assessors	The methodology is being implemented
The job and/or occupation are included in the evaluation.	The assessment includes OH&S management system, people and processes, monitoring and measuring, hazards including general workplace issues and fire	The workplace, job, activity, process, sensitive group, work equipment, hazardous agents and/or preparations utilized, and employment arrangement within the organization are all included in the assessment.
The assessment is performed by a single professional risk assessor	The assessment is performed by a single professional risk assessor	At least two professional risk assessors participate in the evaluation
The 6x7 grid methodology's mathematical model yielded the estimated values.	The 5x5 grid methodology's mathematical model provided the estimated values.	In order to attain the relevance of the risk and the suggested measures, the evaluator selects associated values for various types of mathematical models, such as 5x5, 4x4, and 3x3, that are specific to the parameter and are used to estimate values.

The risk is evaluated at the specified level, and the suggested actions can lower it to a level that is deemed acceptable.	The risk is evaluated at the level that has been recognized, and the suggested actions are prioritized and supported.	Depending on the stated goal and objectives, the risk can be evaluated in three distinct ways: initially, as suggested, as a residual, and weighted using the fundamental methodology.
The degree to which traditional professional risk assessment methodologies meet the requirements of the OH&S management system depends on the nature of the interaction between the evaluator and the management representative of the business.	The methodology includes the study of the application of OSH management system requirements	The approach incorporates harmonized components of current legal requirements, OH&S management system standards, and traditional approaches of occupational risk assessment.
The methodology is not associated with a calculation tool	The methodology is not associated with a calculation tool	The methodology is made easier to use with the help of a fast computation tool.
No reference is made to how to deal with certainty hazards	No reference is made to how to deal with certainty hazards	Certainty hazards are identified and addressed
The outcomes achieved through the use of alternative approaches are not mentioned.	No reference is made to the results obtained by applying other methodologies	The methodology includes the calculation elements and references regarding the results obtained by the classical methodologies
Regarding the implementation of OH&S management systems, there are no references.	The methodologies integrates some the requirements of OH&S management systems	The methodologies integrates the requirements of OH&S management systems
The severity is solely related to injuries and is expressed as a result of the event; damage is only included in other approaches.	The severity refers to injuries, first aid and hospital treatment	The relationship between consequence and damage is how severity is conveyed. The degree of injury is determined by dividing the trauma to disease ratio, and the amount of material damage is calculated based on the organization's financial standing.
Statistics that are uncorrelated with the variety of current activities are used to calculate probability.	Probability is establish by assessor unlikely, possible, likely and probable	The rate of an event occurring and the exposure's path, duration, and frequency are taken into account while analyzing probability.
The assessment does not disclose management involvement.	The assessment withholds information on management involvement.	The assessment takes management participation into account.
The calculation remains unchanged if more workers are exposed.	The number of workers are included in the evaluation	Both the number and quality of employees are part of the assessment.
The level of insurance requirements is not assessed	The assessment includes the degree of assurance of OH&S management and legal standards.	The evaluation takes into account the degree of assurance regarding OH&S management and regulatory requirements, and it guarantees a proportionately accurate adjustment of the risk level.
A risk weight is not covered and calculated	The risk and its weight are exactly proportionate to each other.	Introduction is the risk's weight of importance, which is directly correlated with the risk.
A calculation of the Insurance Level of system requirements is not covered	A calculation of the Insurance Level of system requirements is not covered but is analised	New coefficients are introduced for the calculation of the level of assurance of the OH&S management system requirements: Level of risk analysis, Level of risk treatment, Level of verification of prevention and protection measures and Level of OH&S improvement
For the risk assessment of the worker, he is only interviewed	To assess the worker's risks, he is interviewed and an assessment form will be completed	To assess the worker's risks, he is interviewed and completes a self-assessment form

Outlining actions is the extent of risk management.	Risk management is carried out by prioritizing and reanalyzing measures	One of the risk management strategies is chosen in the assessment.
The risk following its treatment is not recalculated	The residual risk level is calculated	The residual risk criteria is calibrated depending on the circumstances around the risk management.
Risks are not reviewed in the assessment	The risks can be reviewed by calculating the residual risk	The risks can be reviewed in the assessment by calculating the proposed residual risk
After risks are addressed and the required preventative and protective measures are put in place, the identified risk is no longer reassessed.	Residual risk level is the risk that is projected following the prioritising of preventive and protective measures	The degree of risk that is first identified stays that level of risk. The level of residual risk that remains after dangers have been addressed and preventative and protective measures have been implemented is known as the residual or accepted level of risk.
The risk record and the risk assessment report are interchangeable.	There is no distinction between the risk assessment report and the risk register	The working application produces a report known as the risk register.
The evaluation is primarily subjective and statistical.	The evaluation is primarily subjective and statistical, depending on how the responses are interpreted.	Considering it is tailored to each of the two specialists' evaluators, the assessment is mostly subjective.

3. RESULTS AND DISCUSSION

In the paper was chosen to present only the parts significant to the proposed objective, namely the presentation of the new MEvAR methodology. The key components of the new methodology, which incorporate the forms of the organization's management directly into the risk formula's calculation and thereby gain control over changes in probability and exposure directly from the evaluation, will be observed by comparing the values of professional risks assessed by the methodologies selected for comparison. The difference is in the way of treatment, the first methodology establishes a risk value that will have to be maintained through subsequent measures and the second one establishes an identified risk level and a residual one depending on the way of planning and ensuring the treatment of the risk already included in the calculation (see high risk vs. tolerated risk, both having similar or equal values in the identification phase, the final result being differentiated by the way of subsequent treatment or already included in the calculation). The values are calculated in accordance with the formulas and calculation grids specific to the calculation methodologies in the evaluation. Following the comparative analysis of the application of the evaluation methodologies, the following can be observed:

- identified risks can be associated and aggregated
- the calculation methodologies are similar, being based on the weighted arithmetic mean
- the results of the methodologies can be compared through the conversion and interpretation grid
- the MEvAR methodology ensures the calculation of residual risk and introduces correction factors that depend exclusively on management involvement and compliance with legal and management system requirements

The innovative part resulting from this study can be exemplified by the introduction of a conversion grid between the selected evaluation methodologies, the visualization of the characteristics of the evaluation results, the ease of use of the new methodology by using the Microsoft Excel tool. Based on the specifics of the MEvAR methodology to involve management in the establishment of corrective measures on occupational risks, we only followed the brief presentation of this possibility of simplifying the calculation of the residual risk and the conversion scheme of the results because the calculation formulas differ. The MEvAR methodology introduces a report of risk correction related to management involvement and compliance with legal and management requirements. The methodology has no predefined applicability because:

- different methodologies can be used to analyze the risk factors of the work system components (can be chosen by the assessor)
- the list of identifiable risk factors is adapted and completed
- the risk factors specific to the implementation of the OS&H management system are introduced, which depend on the realities of the environment and activities
- the application of the two correction factors that modify the level of identified and/or residual risk depending on the way of achieving compliance with legal and system requirements, as well as the direct involvement of managers in risk treatment is optional
- the input elements are defined by each evaluator and the results are obtained in real time, thus there is the possibility of comparison and evaluation when the values change
- the methodology can be applied to different fields of activity or work environments depending on the use of the list of predefined risk factors or by completing the identified elements by evaluators, there being no restrictions or limitations in this respect.

Regarding the work environment, dangers and protection or safety measures, the methodology is comprehensive considering the completion of the list with the identification of risk factors in all components of the work system, the introduction of a new category **other risks** and the introduction of risk factors generated by the application of the system of management.

Their aggregation and analysis constitute a more in-depth picture of the risk situation of the analyzed workplace and based on this, the methodologies offer the necessary prevention and protection measures (preset or which can be entered by the evaluator).

The methodology can be extended depending on each evaluator according to the results that want to be ensured, horizontally not only two methodologies can be used but several adapted to each component of the work system or the identified risk and vertically they can overlap not only the assurance of the requirements legal minimums but also the policies of the fields of activity or good practices, targeted qualitative indicators, other elements. The methodology carries out an intervention design that changes the value of the final impact of the risk to the desired level, the level involves changing the risk calculation by introducing the correction factors **Compliance** and **Involvement** through the direct actions of the management.

4. CONCLUSION

These have led to the following provisions that need a deeper look and rapid resolution.

By increasing the number of risk factors analyzed in MEvAR, the weight of each new risk factor introduced into the calculation will at first sight be reduced, each induces its own risk that must be analyzed and may present a dilution of importance.

However, by introducing the two elements of the OH&S management system, compliance with legal and system requirements and management involvement in risk treatment, the value and weight of each risk changes significantly depending on the level of insurance.

Also, the analysis of the work system together with the OH&S management system requirements ensures the identification of the main risk factors that can generate an impact on the activity and personnel in a complex system integrated with the organization's policies and objectives.

The influence of changing the value of a risk factor higher than the average by ensuring measures in the case of common methodologies referring to the risk level are presented is little significant depending on the number of risks, the weight of major risks and the methodologies specific calculation.

In order to have a risk with an average value calculated and assessed by the classic methodologies, a corrective measure will be established which, after application, will have an expected result; however, if we introduce the correction factors specific to the MEvAR methodology, action is taken not to minimize the risk analysis, but to the way of reporting the risk in the sense of the intervention. This modality constitutes the reference part of the methodology that introduces precisely the area of usefulness from the technical side of risk management.

The change in the value of the risk results only from the application of correction methodologies that change the ratio between the probability of an event occurring and the impact on workers in the sense of limiting, maintaining, or monitoring its values if it cannot be eliminated. In the case of traditional methodologies with several roughly 10–50 risks, the weight of a reduced value with a level of appreciation due to ensuring a measure is limited in comparison to the weighted arithmetic mean of partial risks; however, in the methodology MEvAR by convention is chosen, the possibility of introducing correction factors that grant a much larger collateral of highlighting the results is available. The common assessment methodologies, provide data on the partial risks, the risk level, and the security level, which ensures the requirement for the identification and assessment of risks, the proposal of preventive measures and the maintenance of the risk level.

The MEvAR methodology additionally ensures the highlighting of risks with unacceptable values and insists on how to treat them in the sense of ensuring the principles aimed at the elimination, replacement, transfer, control and monitoring of those that cannot be avoided.

In conclusion, it can be observed from the study that if we overlap with the existent risk assessment methodology the requirements of compliance and the involvement of management in ensuring prevention and protection measures, a reduction of the initially identified risk level will be obtained by changing the way of risk analysis in the sense of highlighting particular risks that have an intolerable level, not accepted in accordance with the policies and objectives of the organization and the current legal requirements. The proposed objectives were achieved and according to the results and analysis from the previous chapter, the necessary conclusions can be drawn regarding some significant advantages regarding the application of occupational risk assessment by the MEvAR methodology. After analyzing the application of the MEvAR methodology we can conclude:

- the methodology is applicable in different fields of activity because it can use different adapted evaluation methodologies
- the methodology applies the management system principles and new identified risk factors
- the methodology presents significant advantages considering:
- the introduction of novelties such as managerial involvement in risk treatment;
- compliance with legislation and management systems;
- the use of real-time spreadsheets for visualizing the impact of the measures proposed to treat risks;
- analysis of dangerous chemical substances and preparations
- analysis of the way of setting up the workplaces
- analysis of sensitive groups
- presentation of performance indicators

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MEvAR - O METODOLOGIE INOVATIVĂ DE MANAGEMENT A EVALUĂRILOR PROFESIONALE

Rezumat: Lucrarea își propune să prezinte un studiu privind oportunitatea și fezabilitatea aplicării metodologiei de management MEvAR a evaluării riscurilor profesionale.Metodologia MEvAR asigură, într-un mod inovator, suprapunerea elementelor principale de identificare și evaluare a evaluării riscurilor profesionale cu cerințele sistemului de management și ale legislației S&H. Sunt prezentate elementele de bază ale metodologiei, structura, modelul matematic, o listă actualizată a factorilor de risc, grile de calcul și comparații cu principalele metodologii utilizate în România pentru a evidenția principalele avantaje. Rezultatele studiului oferă cerința necesară pentru o metodologie de management de evaluare a riscurilor ocupaționale care poate fi utilizată cu ușurință de specialiști și manageri.

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