1. How do Goerlandt et al. (2017) suggest that the validity of QRA approaches can be validated? What did they posit was the most effective approach?

(Goerlandt et al., 2017) Propose various methods for validating Quantitative Risk Analysis (QRA), including empirical validation, expert judgment, and sensitivity analysis. They underscore sensitivity analysis as the most potent technique, as it aids in pinpointing critical variables that influence risk outcomes and tests the robustness of models in diverse scenarios. Their recommendation to combine these methods to tackle the complexity and uncertainty inherent in large-scale projects, with a specific focus on quality assurance, is a significant finding in risk analysis (Goerlandt et al., 2017).

Other research, particularly (Aven, 2016), supports Goerlandt et al.'s (2017) approach. Aven highlights the importance of sensitivity analysis and expert judgment in ensuring the robustness and accuracy of risk models. This study also emphasises the role of empirical testing as essential to validating risk models, further reinforcing the argument that a combination of validation techniques provides a more comprehensive assessment.

2. Which techniques did Demeulemeester and Van de Vonder (2023) suggest should be applied to project management? What were their recommendations to increase the use of QR analysis in projects?

(Creemers et al., 2014) propose several innovative approaches to quantitative risk analysis (QRA) techniques in project management, mainly focusing on risk factor modelling and identification through simulations such as Monte Carlo simulations. Their study emphasises the importance of using risk analysis techniques beyond

traditional methods by incorporating project-specific insights that help to manage uncertainties better.

To increase the adoption of QR analysis in projects, they recommend the following actions:

1. Improve individual competence: Provide training and hands-on experience to project staff.

2. Align organisational approaches: Create a risk-aware culture across all levels of the organisation.

3. Address misconceptions about QRA: Educate staff on the benefits and limitations of QR analysis.

4. Allocate resources: Provide adequate budgets, tools, and software for risk management activities.

These recommendations are supported by (Raz & Michael, 2001), who also emphasise the need to improve organisational maturity in risk management and integrate tools such as Monte Carlo simulation to handle project risks better.

3. The last paper reviews various Multi-Criteria Decision Methods (MCDMs) and considers the relative accuracy and validity of the techniques. Which did they find was the most accurate of the methods compared? What were the failings of the general TOPSIS approach?

(Çelikbilek & Tüysüz, 2020) conducted a comparative analysis of several Multi-Criteria Decision Methods (MCDMs), including TOPSIS, AHP, VIKOR, and MOORA. Their study concluded that AHP (Analytic Hierarchy Process) and MOORA (Multi-Objective

Optimization based on Ratio Analysis) performed more accurately than TOPSIS, especially in ranking alternatives.

They identified several shortcomings of TOPSIS:

1. Sensitivity to data distribution: TOPSIS depends on how the data is distributed, performing poorly when data are arranged vertically or randomly.

2. Euclidean distance limitations: Relying on Euclidean distance calculations can result in inaccuracies, especially when criteria are correlated or vary in importance.

3. Rank reversal issues: The method is prone to rank reversals, where adding or removing an alternative can alter the ranking of other options.

These criticisms align with the findings of (Zavadskas et al., 2014) who note that rank reversal and Euclidean distance limitations are significant drawbacks of the TOPSIS method, making AHP a more reliable choice in decision-making scenarios.

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