

**ASSESSING THE ACCURACY OF EVALUATIONS FOR
MANAGERIAL POSITIONS PRONE TO CORRUPTION RISKS****Závadský J., Osvaldová Z., Závadská Z., Hiadlovský V., Bujda P. ***

Abstract: This article aims to evaluate the accuracy of two distinct methodologies—the multi-criteria (MC) approach and the process-based (PB) approach—for assessing corruption risks in managerial job positions within ISO 37001-certified organizations. Unlike prior research, this study is the first to directly compare these methods using standardized risk scales, allowing for a quantitative assessment of their accuracy. The PB approach analyzes critical decision-making activities, while the MC method uses predefined weighted criteria. The study calculated a Job Position Corruption Risk Number (JPCRN) under both methods and introduced a novel accuracy metric ($\Delta J P_i$) representing the difference between them. Although the MC method provides acceptable overall accuracy (average $\Delta J P_i = 0.16$), it becomes less reliable when organizations have very few or many high-risk positions. The findings underscore that organizations with elevated corruption risk profiles need to adopt a more precise PB method.

Keywords: managerial job positions, corruption risks, process-based approach, multi-criteria approach, accuracy rate

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Introduction

Organizations certified to the ISO 37001 standard must assess the job positions exposed to corruption risks. Some organizations primarily use a multi-criteria (MC) approach, while others rely on a process-based (PB) approach. Notably, no organization employs both approaches simultaneously. This raises a critical question: Are both approaches equally accurate in identifying and assessing

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corruption risks in managerial job positions? The MC approach evaluates specific aspects of corruption linked to managerial positions. Conversely, the PB approach focuses on process analysis and identifies critical decision-making activities that could be susceptible to corruption. For a comparison, both approaches must be evaluated using the same scale. By applying a uniform scale, we can identify discrepancies and similarities in the results produced by the MC and PB approaches, thereby determining their relative strengths and weaknesses. The exposure of a job position to corruption risk is quantified by the Job Position Corruption Risk Number (JPCRN). This risk can be assessed using two approaches: the PB approach, which involves analyzing processes and critical activities, and the MC approach, which utilizes predefined criteria for all job positions.

Research Gap

The research gap lies in our limited understanding of how sensitive organizations are in assessing managerial positions exposed to corruption risks and determining which MC or PB approach is more accurate, acceptable, or potentially inaccurate. To address this gap, it is essential to compare both approaches consistently, using the same quantitative intervals and scales for assessment. While ISO 37001-certified organizations use different methodologies to assess corruption risks, a standardized comparison using the same scales and intervals is crucial. At the same time, the present study also investigated potential factors that influence the degree of accuracy of the assessment of the riskiness of managerial job positions as follows,

- number of all managerial job positions in the organization
- number of managerial job positions that are exposed to middle or high corruption risks
- ratio between managerial job positions that are exposed to middle or high corruption risks and all managerial job positions
- average Job Position Corruption Risk Number resulted from MC approach
- average Job Position Corruption Risk Number resulted from PB approach
- difference between the process-based and multi-criteria approaches to assessing the riskiness of managerial job positions exposed to corruption risks

Research Objectives

The main objective of this research is to compare the accuracy and sensitivity of the multi-criteria approach and the process-based approach in assessing the corruption risks of managerial job positions in ISO 37001-certified organizations. Partial objectives are:

- PO1: To compare the MC and PB approaches' quantitative accuracy in assessing managerial job positions' corruption risks.
- PO2: To identify and analyze critical variables that impact the accuracy of the MC and PB approaches in determining the corruption riskiness of managerial job positions.

- PO3: To evaluate the difference between the MC and PB approaches in assessing corruption risks and determine whether these differences achieve an acceptable level of inaccuracy.

Literature review

Dankiewicz et al. (2024) and Ennouri (2013) identified key risk types and examined factors influencing risk perception and management approaches based on a literature review for risk management. For this research study, it is necessary to focus on specific types of risks – corruption risks and their relationship to managerial positions. Krishnamurti et al. (2018) delve into how CSR activities at the firm level can mitigate corruption risk. Similarly, Lopatta et al. (2017) investigate the relationship between CSR performance and corporate corruption, introducing a novel firm-level corruption score derived from corporate disclosures. On a different note, Hohn et al. (2023) examine the effects of national culture on CSR performance in the context of corruption. However, they find that the level of corruption in a country does not significantly affect corporate responsibility behaviors, suggesting that cultural factors may have a more profound influence on CSR practices than the corruption level. Schwartz and Tilling (2009) provide a critical perspective on the standardization of CSR through ISO 26000, arguing that such frameworks might isolate CSR from the complex realities of organizational performance, particularly in low-income countries where corruption, poor working conditions, and weak regulatory compliance are prevalent. The significance of ISO 37001 as an anti-bribery management system (ABMS) is universally acknowledged for its effectiveness in mitigating bribery risks at national and international levels. Méan and Gehring (2018) describe ISO 37001 as pivotal in establishing a global standard recognized by public authorities, enforcement agencies, and business partners. Building on this framework, Veselovská, Závadský, and Závadská (2020) introduce an innovative Bribery Risk Index (BRI) to measure and manage bribery risks more effectively. This index aligns with ISO 37001 to enhance corporate social responsibility through a detailed analysis and creation of a specific list of bribery risk factors derived from empirical case studies. In the mining sector, the evolving trends of anti-bribery disclosures are thoroughly analyzed by Makhdalena, Zulvina, and Zulvina (2021), who document an increase in transparency over three years among firms listed on the Indonesia Stock Exchange. Furthermore, Cardoni, Kiseleva, and De Luca (2020) explore the integration of continuous auditing and data mining as strategic tools for anti-corruption. Managerial positions typically hold significant decision-making authority, which can influence the allocation of resources, approval of contracts, and other critical activities. La Rosa, Bernini, and Terzani (2022) investigate the relationship between corporate and country corruption risk and CEO performance, using a sample of 455 observations from 249 listed companies. Their findings indicate that corporate corruption risk negatively impacts CEO performance, but this relationship is moderated by country-level corruption risk. Monteduro et al. (2020) explore the impact of stakeholder engagement on

corruption risk management within public organizations. Aponte (2019) discusses the ambiguities and uncertainties in corruption risk within public procurement. He emphasizes the need for detailed risk assessment and classification to mitigate corruption risks in contract design and execution, underscoring the importance of clear legal frameworks to ensure the integrity of public procurement processes. Hazy et al. (2023) propose a process theory of corruption risk using complexity science concepts. Fazekas et al. (2016) developed an objective corruption risk index using public procurement data from Hungary. Decarolis and Giorgiantonio (2022) contribute to detecting corruption in public procurement by expanding the set of quantitative indicators, or "red flags." Using machine learning tools, they validate the effectiveness of these indicators and quantify the increased corruption-prediction ability when additional data are included. Lisciandra et al. (2022) introduce a corruption risk indicator for public procurement using a two-stage approach. They first estimate potential waste scores and then isolate corruption from inefficiency. Kim and Wagner (2020) examine the stock price effect of corruption risk within supply chains; Vasconcelos and Cavique (2022) present a dataset for corruption risk assessment in public administration, integrating data from eight different Brazilian federal systems. Velasco et al. (2020) describe a decision support system (DSS) for fraud detection in public procurement in Brazil. This system uses data mining algorithms and advanced data science methods to identify corruption risk patterns, such as collusion and conflicts of interest. Pogozhina and Sergeeva (2021) investigate the role of the logical component of thinking in decision-making about corruption risk in business interactions. Fazekas and Kocsis (2020) developed objective corruption risk indicators using public procurement data from 28 European countries. Their study identifies single bidding in competitive markets and tendering 'red flags' as key corruption indicators. Sharma, Sengupta, and Panja (2019) map corruption risks in public procurement, integrating grounded theory with fault tree and failure mode effects analysis. Their methodology identifies critical corruption risk factors and their interrelationships, offering practical insights for strengthening organizational controls and improving procurement processes. Charron et al. (2017) explore the impact of bureaucratic meritocracy on European public procurement processes. Yanishevskaya et al. (2023) analyze corruption risks in the provision of administrative services, highlighting the impact of these risks on public trust and constitutional principles. Budak et al. (2023) investigate the determinants of corruption pressure on the business sector in European countries. They find that the share of retail and wholesale trade and public companies correlates with bribery incidence. Wu and Huang (2013) investigate the motives and likelihood of bribery among managers in Taiwan, focusing on affiliation, achievement, and power as primary motives. Ashyrov (2020) examines the impact of managerial traits on firm-level corruption in Vietnam. Using data from micro, small, and medium firms, the study finds that risk-loving and innovative managers are likelier to engage in bribery. At the same time, those with an internal locus of control are less likely. Werner et al. (2019) explore the determinants of managers' corruption prevention efforts in

Germany's small and medium-sized enterprises (SMEs). Based on the theory of planned behavior, their study identifies moral obligation, subjective norms, self-efficacy, perceived controllability, and perceived threat of employee corruption as key factors influencing managers' intentions to implement corruption prevention measures. Belhaiza et al. (2022) study the impact of corruption on the behavior of managers and controllers within a game-theoretical framework. Vu et al. (2021) investigate the influence of the local business environment and managerial expertise on tax corruption among small and medium-sized enterprises in Vietnam. They find that firms with more capable managers are more likely to engage in tax corruption, but improving the local business environment reduces this propensity. This study suggests that enhancing managerial knowledge and experience, alongside improving the business environment, can effectively combat tax corruption. Using the Grid-Group framework, Akbar and Vujic (2014) explore the relationship between national culture and corruption. Analyzing data from 55 countries, they find that hierarchical and fatalistic cultures are positively correlated with corruption, while egalitarian cultures are negatively correlated. Ntayi, Ngoboka, and Kakooza (2013) examine the relationship between moral schemas and corruption in Ugandan public procurement. Hermann, Pohlmann, and Klinkhammer (2019) analyze the influence of informal norms and criminogenic values on managers' willingness to commit corruption. Their study distinguishes between organizational and individual corruption, highlighting that informal norms within organizations significantly affect the propensity for corruption. Thus, the researchers proposed an empirical research methodology based on the literature review and research gap.

Research Methodology

The literature review supports formulating the research questions, hypotheses, and methodological design by framing corruption risk assessment as a multidimensional issue influenced by organizational behavior, decision-making structures, and evaluation frameworks. Correlation analysis is the most appropriate method for testing the research hypotheses in this study because it measures the strength and direction of relationships between continuous variables—without assuming a causal relationship. Given that the hypotheses (H1, H2, H3) aim to explore whether specific organizational characteristics (e.g., number of managerial positions, proportion of high-risk roles, average risk scores) are statistically associated with the accuracy difference (ΔJP_1) between the MC and PB approaches, correlation analysis offers a clear, interpretable, and statistically valid approach. Specifically, Spearman's rank correlation coefficient was used due to its robustness in handling non-parametric data and ordinal variables. It is beneficial when the underlying data may not meet normality assumptions. This method suits the organizational context well, where sample sizes are relatively small, and data distributions may vary across entities. The use of correlation analysis in corruption and risk assessment studies is well-documented. Fazekas et al. (2016) applied correlation and regression techniques to examine the relationship between public procurement patterns and corruption risk

indicators. Lisciandra et al. (2022) used correlation analysis to construct a corruption risk indicator based on inefficiency and waste scores. La Rosa et al. (2022) explored correlations between corporate corruption risk and CEO performance. These studies validate the relevance of correlation analysis in exploring nuanced relationships in corruption-related research. By adopting this method, the current study ensures methodological consistency with prior empirical work while aligning with the complexity of risk assessment in organizational settings.

Research Questions and Hypotheses

Following the identified research gap, the authors terminated these research questions:

- RQ1: Is there a significant difference in accuracy between the process-based and multi-criteria approaches to the quantitative assessment of the riskiness of managerial job positions exposed to corruption risks?
- RQ2: What critical variables impact the accuracy of determining the riskiness of managerial job positions exposed to corruption risks?
- Two research questions led us to formulate four research hypotheses. If i represents an individual organization in the sample set, then the hypotheses are:
 - H1: Difference (ΔJP_i) between the process-based and multi-criteria approaches to assessing the riskiness of managerial job positions exposed to corruption risks and number of all managerial job positions ($COUNT_JP_i$) are independent variables.
 - H2: Difference (ΔJP_i) between the process-based and multi-criteria approaches and ratio between managerial positions exposed to middle or high corruption risks and all managerial positions ($\%RJP_JP_i$) are independent variables.
 - H3: The independent variables are the difference (ΔJP_i) between the process-based and multi-criteria approaches and the average Job Position Corruption Risk Number resulting from the MC approach (AVG_JPCRN_i).

Studies by Krishnamurti et al. (2018) and Lopatta et al. (2017) highlight how corporate responsibility and disclosure practices intersect with corruption risk, justifying the need to assess job roles, particularly managerial ones, with systematic, quantifiable tools. This aligns with the study's research questions (RQ1 and RQ2) and supports the rationale for comparing the accuracy of the MC and PB approaches in evaluating corruption exposure. The development of novel corruption risk indicators in public procurement, as shown by Fazekas et al. (2016), Lisciandra et al. (2022) and Velasco et al. (2020), underscores the importance of data-driven and process-based assessments. These insights directly relate to the PB approach used in this study, which focuses on analyzing critical decision-making processes. The MC approach reflects the type of structured evaluation used in studies like Veselovská et al. (2020), who developed the Bribery Risk Index using predefined criteria. This aligns with the research using weighted decision-making criteria to calculate $JPCRN_MC$. Further, the role of managerial behavior in corruption—as explored by Ashyrov (2020), Werner et al. (2019), and Belhaiza et al. (2022)—reinforces the study's focus on managerial positions and supports hypotheses H1 and H2. These

hypotheses investigate whether the organizational structure and the proportion of high-risk positions influence the accuracy of corruption risk assessments. Overall, the reviewed literature establishes the theoretical and practical relevance of using multi-dimensional and process-sensitive tools in corruption risk assessment, validating the study's dual-method approach and its investigation into methodological precision. The literature review also identifies a practical dilemma in ISO 37001-certified organizations: using either an MC or a PB approach to assess corruption risks in managerial positions, without empirical clarity on which is more accurate. For example, studies by Méan and Gehring (2018) and Veselovská et al. (2020) stress the importance of aligning organizational practices with ISO 37001 standards and measuring bribery risk using consistent frameworks. These align closely with the MC approach's use of fixed criteria and weighted scoring. Meanwhile, work by Fazekas et al. (2016) and Sharma et al. (2019), who advocate for risk assessments grounded in real-world processes and activities, supports the adoption of the PB approach, which reflects operational realities more closely. H3 tests whether the difference in risk assessment results between the MC and PB approaches (ΔJP_i) is independent of the average corruption risk number produced by the MC approach (AVG_JPCRN_i). This hypothesis stems from a practical question raised in the introduction: whether the general risk profile of an organization affects the comparative reliability of the two methods. Literature on managerial decision-making and corruption vulnerability—such as Ashyrov (2020) and Pogozhina and Sergeeva (2021)—suggests that corruption risk is influenced by contextual, behavioral, and structural factors, not merely by overall averages. This validates the hypothesis that the general risk level, as measured by AVG_JPCRN_i , may not determine the relative accuracy of the two approaches.

Multi-Criteria Approach to JPCRN Calculation

The JPCRN_MC index based on a multi-criteria approach includes decision-making criteria related to the managers (D_i) with the following weights (W_i): D1 (0.15) - Decides on the allocation of financial resources; D2 (0.15) - Decides on the imposition of sanctions and/or fines; D3 (0.3) - Decides on the allocation of licenses, concessions, and permits; D4 (0.2) - Approves contracts and orders; D5 (0.1) - Performs control of the fulfillment of contractual conditions when using funds from the EU or other funds; D6 (0.05) - Comes into contact with non-public information, the leakage of which could have an economic impact; and D7 (0.05) - Prepares documentation for imposing sanctions and/or fines. For each defined criterion, the effect of the exposure of the respective job position to corruption risk is determined. The value of the impact of corruption risk is determined quantitatively as follows:

- the criterion has only a negligible impact on the given job position: 1
- the criterion has a non-negligible impact on the given job position: 2
- the criterion has a concerning impact on the given job position: 3
- the criterion has a very concerning impact on the given job position: 4
- the criterion has a critical/crisis impact on the given job position: 5

The JPCR_N_MC is calculated as the sum of the multiples of the impact and the weight of the given criterion as follows:

$$JPCR_{N_MC_i} = \sum_{i=1}^n D_i \times W_i \quad (1)$$

Where, D_i is the i -th criterion from the set of all requirements; $n = 7$; $D_i \in [1; 5]$ and W_i is the weight of the i -th criterion, with the sum of the weights of all requirements being 1. It applies that if JPCR_N_MC assumes a value of 1 to 2.99, it indicates a job position exposed to low corruption risk; if it assumes a value of 3 to 3.99, it indicates a medium-risk job position; and if it assumes a value of 4 to 5, it indicates a high-risk job position.

Process-Based Approach to JPCR_N Calculation

The JPCR_N for a job position is determined based on previously performed analyses of processes and critical decision-making activities. The calculation is based on two input parameters. Incidences of managerial job position in all identified processes and RPN for each decision-making activity of the process. The calculation is carried out according to the formula:

$$JPCR_{N_PB_i} = \sum_{i=1}^n \frac{RPN_i^{IJP}}{n} \quad (2)$$

Where, RPN_i^{IJP} is the risk priority number for a critical decision-making activity to which a managerial job position is assigned, expressing the incidence of the job position among all critical decision-making activities (IJP), and n is the number of all i -th RPN for the given job position. The following intervals of the corruption risk rate are used to determine RPN_i^{IJP} :

- negligible corruption impact on the manager: 1
- non-negligible corruption impact on the manager: 2
- concerning corruption's impact on the manager: 3
- very concerning corruption impact on the manager: 4
- critical corruption impact on the manager: 5

If JPCR_N_PC assumes a value of 1 to 2.99, it indicates a job position exposed to low corruption risk; if it assumes a value of 3 to 3.99, it indicates a medium-risk job position; and if it assumes a value of 4 to 5, it indicates a high-risk job position. The fundamental difference between JPCR_N_MC and JPCR_N_PB is that JPCR_N_MC operates with a fixed set of seven criteria. Thus, some requirements may not apply to the given managerial job position. On the contrary, JPCR_N_PB operates with a variable number of critical activities. There is always a medium or high corruption risk for necessary activities, and JPCR_N_PB is likely more accurate than JPCR_N_MC.

Research Variables

The following variables were defined for testing hypotheses and correlation analysis, where i represents the individual organization in the sample:

- COUNT_JP $_i$: number of all managerial job positions in the organization
- COUNT_RJP $_i$: number of managerial job positions that are exposed to middle or high corruption risks
- %RJP_JP $_i$: the ratio between managerial positions exposed to middle or high corruption risks and all managerial positions in the sampled organization
- AVG_JPCRN $_i$: average Job Position Corruption Risk Number resulted from MC approach calculated from all managerial job positions
- AVG_JPCRN_R $_i$: average Job Position Corruption Risk Number calculated only for managerial job positions that are exposed to middle or high corruption risks
- Δ JP $_i$: the difference between the PB and MC approaches to assessing the riskiness of managerial job positions exposed to middle or high corruption risks

Data Collection

The empirical research was conducted from September 2023 to March 2024. The research steps are as follows:

- S1: Definition of the **research objectives** (1 main objective and four partial objectives) and **research methods** (Pearson's chi-squared test, Correlation Analysis)
- S2: Definition of **research variables**
- S3: Definition of **selection criteria for the sample** [(1) certified ABMS according to the ISO 370011 standard, (2) utilization of MC approach for assessing managerial job positions that are exposed to corruption risks; (3) existence of a process map containing decision-making activities]
- S4: **Addressing 177 organizations** with a certified ABMS according to ISO 37001 in the Czech Republic and Slovak Republic
- S5: Selection of **organizations that met the three selection criteria** and calculation of the sample representativeness (only 18 organizations had, in addition to the first two selection criteria, a process map developed at the level of decision-making activities; all 18 organizations also had a certified quality management system according to ISO 9001)
- S6: Identification of **managerial job positions in the sample** (332 managerial positions were assessed in 18 organizations. A managerial position is represented as a job with at least one subordinate and at least one decision-making activity)
- S7: Definition of **time sequence** for calculating the research variables (September 2023 - March 2024)
- S8: **Calculation of JPCRN_MC $_i$** based on the evaluation of each managerial position through seven criteria [(the calculation of JPCRN_MC was carried out in collaboration with the persons responsible for the ABMS in each organization; some organizations had less than seven factors for the calculation. Therefore, the authors calculated a new JPCRN_MC according to formula (1)]

- S9: **Calculation of JPCRN_PB_i** for each managerial job position [the calculation of JPCRN_PB was relatively tricky, according to formula (2), a list of all decision-making activities for each managerial position was obtained, for each activity, the corruption risk was determined, and the arithmetic average was used to assess the risk of the given managerial position]
- S10: Calculation of the **difference between the two approaches** (ΔJPi)
- S11: Correlation analysis for **verifying the hypotheses**
- S12: Summary of research results and **recommendations** for increasing the accuracy of calculating the riskiness of managerial jobs.

Research Results

The ratio between the number of organizations approached from the Czech Republic (CR) and the Slovak Republic (SR) was 118 to 59, representing the size of both countries. However, most organizations met the criteria from the Slovak Republic, so the ratio between the CR and the SR in the sample was 7 to 11. The highest number of managerial job positions was 33 in organization O1, and the lowest number of managerial job positions was 7 in organization O18. The average number per organization in the sample was 18.44, with a standard deviation of 7.23. The number of managerial positions assessed was 332. The sample's representativeness was calculated using Pearson's chi-squared test (χ^2 - test). It tests a null hypothesis, stating that the frequency distribution of certain events observed in a sample (n_i) is consistent with a particular theoretical distribution (np_i) at the level of statistical significance (α) for appropriate degrees of freedom ($k-1$), where k is the number of fitted parameters. Respondents were divided into male and female managers to calculate their representative representation in the sample. In the CR, there are 51%, and in the SR, there are 51.9% female managers. Table 1 shows the average expected value of the ratio of women 51.45% and men 48.55%.

Table 1. χ^2 - test due to male and female managers

	np_i [%]	n_i [%]	$(n_i - np_i)^2$	χ^2
Female managers	51.45	49.34	4.45	0.09
Male managers	48.55	50.66	4.45	0.09
			Σ	0.18

The representation among the respondents (managers) was 164 women and 168 men. If the sample representativeness is calculated at the significance level of $\alpha=0.5$, then the value for the representativeness of the set is 0.46. For the research needs, given that there are generally more male managers than female managers, a significance level of $\alpha=0.5$ is also acceptable, and therefore, our sample of respondents is representative. The achieved χ^2 value (0.18) is lower than the critical χ^2 value at the level of statistical significance $\alpha = 0.5$ for 1 degree of freedom (2 - 1), which presents the value of 0.46 (value in statistical tables). It should be emphasized that it is

essential for the research to meet the three selection criteria for organizations. Therefore, the calculation of representativeness is only supplementary and has no fundamental significance for the research results.

Difference between the Process-Based and Multi-Criteria Approaches

The data from organizations O1-O18 were obtained in the structure presented in Table 2 as an example of a data set from organizations O15-O18. The number of evaluated job positions (COUNT_JP_i) included only a set of managerial job positions (MJP) with the authority to make decisions (at least one subordinate and at least one decision-making activity). For the organizations in the sample, the number of managerial positions does not correspond to the total number of employees. The total number of employees is not a variable in our empirical research. Organizations assessed the level of corruption risk through a multi-criteria approach.

Table 2. Data set [O15, O18] for ΔJP_i calculation

No. of MJP	MC	PB1	ΔJP	MC	PB1	ΔJP	MC	PB1	ΔJP	MC	PB1	ΔJP
	15	5	15	16	6	16	17	7	17	18	8	18
MJP1	1.15			4.00	4.00	0.00	3.50	3.75	0.25	3.00	3.25	0.25
MJP2	3.00	3.50	0.50	3.00	3.25	0.25	3.00	3.20	0.20	3.50	3.75	0.25
MJP3	1.05			3.00	3.15	0.15	4.00	4.00	0.00	1.50		
MJP4	1.50			1.75			1.25			1.25		
MJP5	2.00			1.70			2.00			2.50		
MJP6	4.00	4.25	0.25	4.00	4.00	0.00	2.00			2.00		
MJP7	4.00	4.25	0.25	3.75	3.75	0.00	2.25			2.00		
MJP8	3.75	4.00	0.25	2.00			3.00					
MJP9	1.50			2.00			1.15					
MJP10	1.75			2.00			1.25					
MJP11	2.00			1.75			1.75					
MJP12	2.00			1.30			2.00					
MJP13	1.15			1.30			2.00					
MJP14	1.25			1.25								
MJP15				2.00								
MJP16				2.00								
MJP17				2.00								
MJP18				2.75								
MJP19				2.00								
MJP20				2.00								
MJP21				2.50								
MJP22				2.75								
AVG_JPCR N_i	2.15			2.31			2.24			2.25		
AVG_JPCR N_{Ri}	3.69	4.00	0.31	3.55	3.63	0.08	3.50	3.65	0.15	3.25	3.50	0.25
COUNT_JP_i	14			22			13			7		
COUNT_RJP i	4			5			4			2		
%RJP_i_JP_i	28.5			22.7			30.7			28.5		
	7			3			7			7		

Then, JPCRN_PB was calculated. Core business processes were analyzed, and critical decision-making activities were allocated to managerial positions identified by the JPCRN_MC as medium- or high-risk. Each decision-making activity was rated on a scale from 1 to 5, and the arithmetic mean was calculated as JPCRN_PB. Then, ΔJP_i was calculated as the difference between JPCRN_PB and JPCRN_MC. In Table 2, job positions exposed to medium and high corruption risk are highlighted in gray. In column MC is the riskiness calculated by the MC approach; in column PB is the riskiness calculated by the PB approach; in column, ΔJP is the difference between them. Based on the data from the selected sample of organizations, the $AVG_JPCRN_R_i$ was calculated for each organization based on values determined for each managerial position exposed to medium or high corruption risks. $AVG_JPCRN_R_i$ was calculated twice, following the MC and PB approaches. The difference between the two approaches as a measure of accuracy is highlighted in the table by the black color of the cell and the white font of the value. ΔJP_i represents the degree of accuracy, and its intervals are as follows:

- if $\Delta JP_i < 0.1$, then the MC approach for job position assessment is accurate,
- if $\Delta JP_i \in (0.1, 0.25)$, then the multi-criteria approach for job position assessment is acceptably inaccurate, and organizations should consider the PB approach,
- if $\Delta JP_i > 0.25$, then the MC approach for job position assessment is inaccurate, and the organization must revise previous assessments using the PB approach.

The value given in row $AVG_JPCRN_R_i$ and each column ΔJP indicates the accuracy rate of the MC approach to the PB approach of each organization in Tables 2 to 4. Calculating the arithmetic mean of these values gives the accuracy rate for the entire sample set, which is $AVG_JPCRN_R_i = 0.16$. Based on this value, it can be concluded that the difference between the two approaches is acceptably imprecise.

Accuracy Factors of the Corruption Risks Assessment

Hypothesis H1 states that the difference (ΔJP_i) between the PB and MC approaches to assessing the riskiness of managerial job positions exposed to corruption risks and the number of all managerial job positions are independent variables.

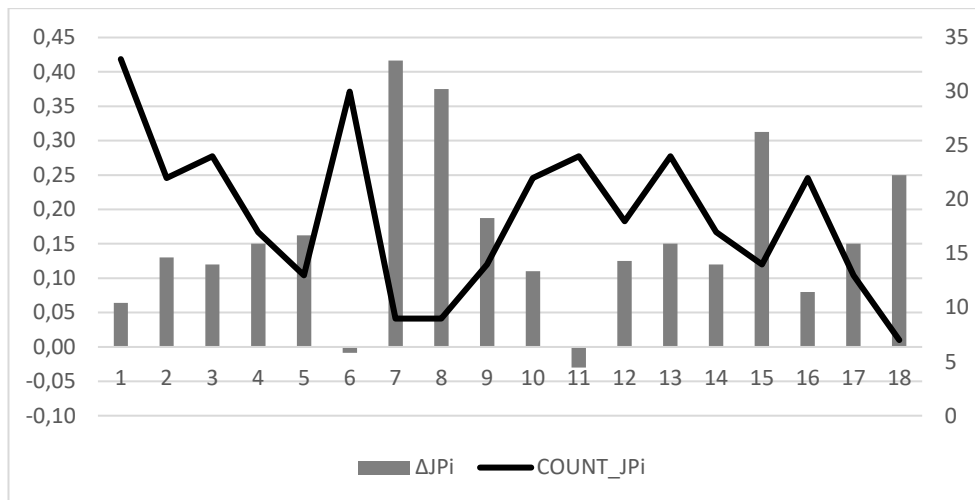


Figure 1: Dependence of the difference between the PB and MC approaches from the number of all managerial job positions

This means that the accuracy of the corruption risk assessment, as reflected in ΔJP_i , is not influenced by the total number of managerial positions within an organization. In the context of corruption risk management, this hypothesis suggests that the effectiveness of the assessment methodologies (MC and PB) is consistent regardless of the size of the management structure. This independence is crucial for developing standardized risk assessment tools that can be universally applied across organizations of varying sizes without bias. As Figure 1 shows, variables are not independent. The correlation coefficient calculated for these two variables (ΔJP_i , $COUNT_JP_i$) reached a value of $r = -0.793$. Based on this, Hypothesis H1 was rejected. In this case, it is a negative linear dependence. The results indicate that the more managerial positions there are in the organization, the greater the accuracy of their corruption risk assessment, and the organization thus demonstrates greater sensitivity to corruption. Hypothesis H2 posits that the ΔJP_i and the ratio between managerial job positions exposed to middle or high corruption risks and all managerial job positions are independent variables. This implies that the variance in accuracy between the two assessment methods is not affected by the proportion of high-risk managerial positions within an organization. If ΔJP_i is independent of $\%RJP_i_JP_i$, organizations can trust that the chosen assessment method will provide consistent results, irrespective of the percentage of high-risk positions.

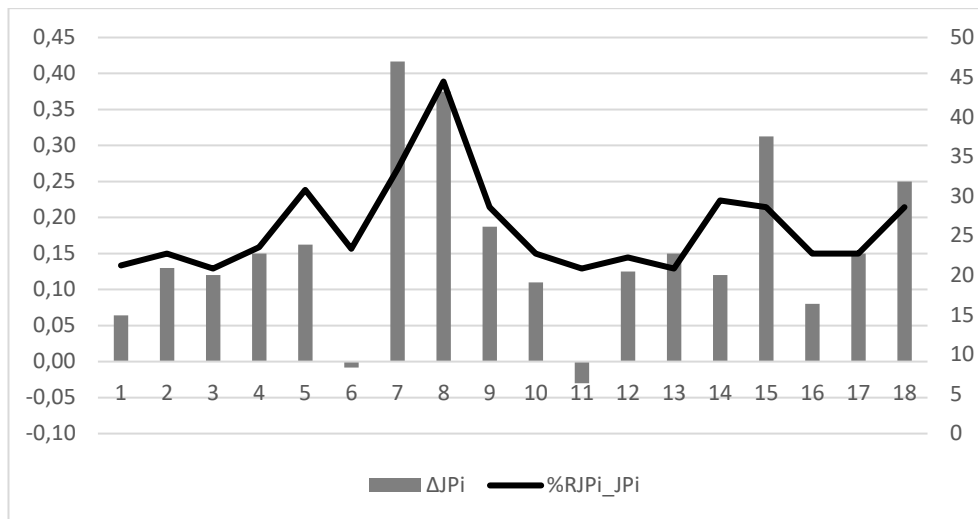


Figure 2: Dependence of the difference between the PB and MC approaches from the ratio between managerial positions exposed to middle or high corruption risks and all managerial positions

As Figure 2 shows, the trend of the variable values indicates a positive linear dependence. This confirmed the visualized data and reached a value of $r = 0.772$. Based on the correlation analysis, the Hypothesis H2 was rejected. Correlation analysis showed that the higher the proportion of medium- and high-risk managerial positions out of all managerial positions, the greater the inaccuracy between the MC and PB approaches. This fact is interesting compared to the previous finding that the more managerial positions are evaluated, the greater the accuracy. Therefore, it can be concluded that as the number of risky job positions increases, the inaccuracy of their assessment also increases. Consequently, it is necessary to always consider the application of the PB approach, especially in organizations with a few managerial positions or with numerous risky managerial positions. Hypothesis H3 asserts that the difference between the PB and MC approaches to assessing the riskiness of managerial job positions exposed to corruption risks and the average JPCRNI derived from the MC approach are independent variables. Demonstrating that $\Delta J P_i$ is not influenced by AVG_JPCRNI_i supports the robustness and versatility of the MC and PB methodologies. It ensures that organizations with different levels of inherent corruption risk can effectively use these tools to implement appropriate anti-corruption measures.

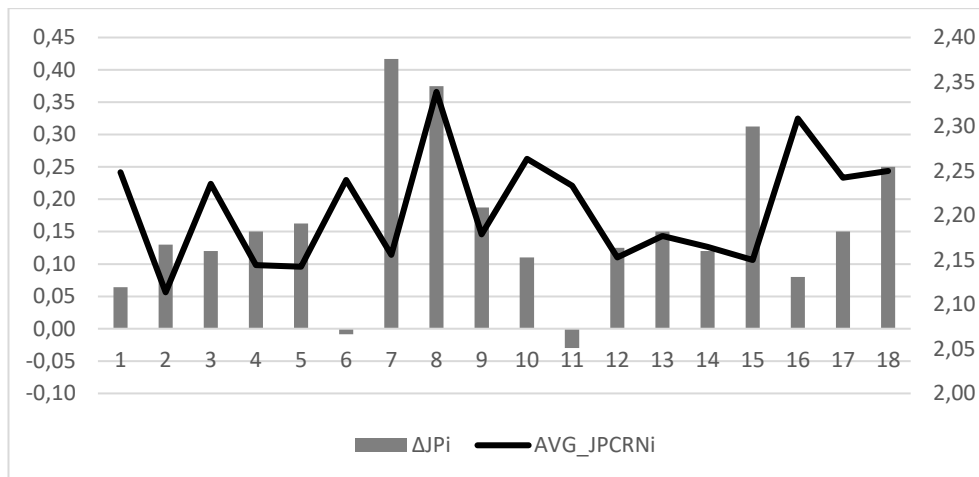


Figure 3: Dependence of of the difference between the PB and MC approaches from average Job Position Corruption Risk Number resulted from MC approach calculated from all managerial job positions

As Figure 3 shows, the trend of the variable values indicates no linear dependence. The correlation coefficient value is -0.082 , which represents almost complete independence of the variables. Based on this value, Hypothesis H3 was accepted. It was confirmed only for the last hypothesis. The average riskiness of all management positions in the organization (even low-risk ones) and the difference between the MC and PB approaches for medium- and high-risk job positions are not related. This result confirms that organizations can use the MC approach for assessment. Still, they should use the PB approach to increase sensitivity to corruption risks and achieve greater accuracy. The PB approach is appropriate when the organization has a large proportion of risky positions out of all positions and when it comes to organizations with a few risky managerial positions.

Conclusion

This study addressed a practical and underexplored problem in anti-corruption risk management—how accurately organizations assess managerial job positions exposed to corruption risks using two different methods: the multi-criteria (MC) and the process-based (PB) approaches. For the first time, both methods were directly compared using a standardized corruption risk scale, and the difference in outputs (ΔJP_i) was used as a novel accuracy metric. Based on data from 18 ISO 37001-certified organizations and 332 managerial positions, the study found that the MC approach, while generally acceptable (average $\Delta JP_i = 0.16$), showed decreasing accuracy when organizations had either a small number or a high proportion of high-risk positions. Correlation analysis confirmed that accuracy improves as the number of managerial roles increases ($r = -0.793$). As the share of high-risk positions grows, the inaccuracy of MC assessments also increases ($r = 0.772$). However, no

relationship was found between overall average risk levels and assessment accuracy ($r = -0.082$), confirming the independence of ΔJP_i from the average corruption risk score. These findings emphasize that while the MC method is serviceable for broad assessments, the PB approach is essential for precision, particularly in complex or high-risk organizational structures. The research makes a novel contribution by establishing clear conditions under which the MC approach may fail, offering a practical decision rule: if ΔJP_i exceeds 0.25, organizations should shift to PB-based assessment. Despite its strengths, the study's limitations include a smaller sample size and regional scope, which may constrain generalizability. The PB method's complexity and data demands also present implementation barriers for smaller organizations. Still, the objectives were fully achieved. The study successfully compared both methods, measured accuracy quantitatively, identified influencing variables, and delivered actionable guidance for choosing between assessment models. It supports more responsive and tailored corruption risk strategies, especially for organizations aiming to align with ISO 37001 standards while maximizing accuracy and efficiency in risk detection.

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OCENA DOKŁADNOŚCI OCEN STANOWISK KIEROWNICZYCH NARAŻONYCH NA RYZYKO KORUPCJI

Streszczenie: Celem niniejszego artykułu jest ocena dokładności dwóch odrębnych metodologii – podejścia wielokryterialnego (MC) i podejścia opartego na procesach (PB) – służących do oceny ryzyka korupcji na stanowiskach kierowniczych w organizacjach posiadających certyfikat ISO 37001. W przeciwieństwie do wcześniejszych badań, niniejsze opracowanie jest pierwszym, w którym bezpośrednio porównano te metody przy użyciu standardowych skal ryzyka, co pozwoliło na ilościową ocenę ich dokładności. Podejście PB analizuje krytyczne działania decyzyjne, natomiast metoda MC wykorzystuje z góry określone kryteria ważne. W ramach badania obliczono wskaźnik ryzyka korupcji na stanowisku pracy (JPCRN) dla obu metod i wprowadzono nową miarę dokładności (ΔJPI) reprezentującą różnicę między nimi. Chociaż metoda MC zapewnia akceptowalną ogólną dokładność (średnia $\Delta JPI = 0,16$), staje się ona mniej wiarygodna, gdy organizacje mają bardzo mało lub bardzo wiele stanowisk wysokiego ryzyka. Wyniki podkreślają, że organizacje o podwyższonym ryzyku korupcji powinny przyjąć bardziej precyzyjną metodę PB.

Słowa kluczowe: stanowiska kierownicze, ryzyko korupcji, podejście oparte na procesach, podejście wielokryterialne, wskaźnik dokładności