


# Increasing the prevention of process failure and the overall resilience of businesses through the process risk assessment

## Peter Kardos

University of Zilina, Faculty of Security Engineering, Department of Crisis Management

peter.kardos@prims.sk

 0000-0001-8367-7962

## Iveta Chmielová Dalajková


Pan-European University, Department of Entrepreneurship and Management, Prague, Czech Republic  
chmielovadalajk@is.peuni.cz

 0009-0001-9060-6051

## Najid Ahmad

School of Business, Hunan University of Science and Technology, Xiangtan, China

najid\_2iqbal@yahoo.com

 0000-0002-7305-825X

## ABSTRACT

**Research background:** Properly set processes represent the basic framework of enterprise management. By assessing process risks, enterprises can timely identify problems in the implementation of processes, which can cause failure or interruption of activity, a decrease in performance, an increase in process costs, etc.

**Purpose of the article:** The aim of the article is to identify, analyse and quantify the approach of enterprises to process risk assessment with the intention of improving processes, increasing the prevention of process failures and the overall resilience of the organization.

**Methods:** A questionnaire was created to find out the attitudes of enterprises in the assessment of process risks. Data collection was carried out by an external agency using the Computer Assisted Web Interview method. The sample consisted of 353 enterprises from the business environment of the Slovak Republic. The questionnaire was evaluated using the simple sorting method. The research hypotheses were evaluated by applying Chi-square test.

**Findings & Value added:** Enterprises most often assess risks in quality control, production processes, service provision processes. The frequency of assessment of process risks is for a third of the enterprises with every change, planning, disagreement or fluctuation of the economic indicator. More than 40% of Slovak enterprises do not have any management system implemented. The business sector is an important factor in the use of methods for the identification, analysis and evaluation of process risks. To identify process risks, in service sector, the owner/manager's own experience is used to a greater extent than in enterprises in industry. Enterprises in service sector use risk detection for risk analysis, industrial enterprises use process FMEA. Enterprises in service sector use scenarios analysis and enterprises in industry use the effectiveness of measures to evaluate process risks. Every tenth enterprise stated that the human factor is the cause of the occurrence of problems in up to 70% of all processes in the enterprise. Enterprises in service sector for process measurement use productivity of the enterprise to a greater extent than enterprises in industry, which use multiple economic indicators.

**RECEIVED:** April 3 **ACCEPTED:** June 10 **PUBLISHED ONLINE:** June 30

**KEYWORDS:** assessment, industry, quantitative research, process risk sources, services, Slovak republic

**JEL CLASSIFICATION:** O11, M21, L10

**CITATION:** Kardos, P., Chmielová Dalajková, I., Ahmad, N. (2024). Increasing the prevention of process failure and the overall resilience of businesses through the process risk assessment. *Journal of Business Sectors*, 2 (1), 68–78. <https://doi.org/10.62222/FWNR2982>

## INTRODUCTION

Risk assessment is a tool for preventing unwanted events in enterprises. It is important for enterprises to deal with risk assessment and create an approach to risk

assessment that will be part of the management of the enterprise and all its processes (Virglerova, 2018; Khan et al., 2019). Such an approach assumes that the enterprise will be able to prevent undesirable events and react to them if they occur, which can positively affect the

achievement of the objectives and the overall performance of the enterprise (Lopez, 2021; Ključnikov et al., 2022).

According to surveys (ENISA, 2024; IRM, 2024; FERMA 2024) enterprises assess process risks, especially those which have implemented quality management system. Large enterprises use several software solutions when assessing process risks. Most of them have a built-in functionality for assessing risks, especially from the risks for the enterprise as a whole point of view or as part of monitoring the fulfilment of legislative and other requirements. Enterprises, which assess process risks focus on the main processes of the enterprise, i.e. production or service provision processes. Secondary processes are assessed marginally or are left out of the assessment. While secondary processes are directly connected to the main ones and their failure can have a direct impact on the failure of the main processes and the overall performance of the enterprise. In some cases, risk assessment is a mandatory requirement of the ISO 9001 standard and is not given much emphasis, especially in small and medium-sized enterprise (Avilova et al., 2017; Gengatharan et al., 2020).

According to the authors of (Brocke & Sinnl, 2011; Fosso & Mishra, 2017; Hudakova et al., 2021), enterprises use different procedures when assessing process risks, there is a lack of a uniform methodological procedure for assessing process risks, which may result from the fact that the terminology is not sufficiently developed and there are only a few theoretical backgrounds, which describe the process risk assessment in more details (Dillen, & Vandekerckhof, 2021).

The issue of process risk assessment is a specific area of risk management, which is important in the strategic management of the enterprise (Ireta-Sanchez, 2023). The originality of the article lies in the fact that the authors evaluated a uniquely created research aimed at assessing the process risks of the enterprise. The research results are original in their content and usability. They fill the gap in process failure prevention tools and provide guidance on how to increase overall process performance and process resilience. They are the next step in the wide application of risk management principles in the conditions of enterprises in Slovakia.

The scientific article has the following structure. In the introduction, the reader is introduced to the issue of process risks and the business environment of the Slovak Republic. Follow by the formulation of motivation for writing the article and the originality of the article. The theoretical part of the article contains critical research into the given issue of process risks and methods of their evaluation not only in the business environment of the Slovak Republic but also in other V4 countries. The aim of the article is formulated in the methodology; as well as data collection procedure and methodology; information about the questionnaire; research questions and statistical hypotheses, methods used for their evaluation and demographic structure of enterprises. The results are presen-

ted in the form of pictures and tables. The results of testing (Chi-square tests) and evaluated statistical hypotheses are also presented in this section. The discussion includes a summary of the achieved results and their comparison with the results of similar studies dealing with the issue of process risks. In the end, the authors formulated the limitations of the research, the future direction of the research activities of the research team, as well as the users for whom the findings in the article are beneficial.

## THEORETICAL BACKGROUND

Process management is the systematic identification, visualization, measurement, evaluation and continuous improvement of enterprise processes using methods based on the process approach (Ferreira de Araújo Lima et al., 2020). The identification of processes consists in defining the individual elements of the process, of which it is composed. When identifying processes and their interconnection, enterprises use process visualization, e.g. in the form of a process map. A process diagram as a "detailed description of activities in graphic form" and a process model as a "process map supplemented with resources and other information" can also be part of the graphic representation of processes (Alem et al., 2020).

The measurement of the process indicators is the process evaluation tool. By measuring is determined the functioning of the processes, as well as the functioning of the enterprise (Hassel & Cedergren, 2021). These indicators are most often referred to as Key Performance Indicators (KPI). By determining the limit values of the indicators and measuring them, enterprise can determine whether there are potential risks in the process. According to Fraser & Simkins (2016) KPIs also implicitly represent a set of measures for those aspects of performance which are most critical for the current and future success of the enterprise. Basic process measurement criteria include measuring costs – what costs each activity has, quantities – how many outputs the process produces, reliability – how often the process fails, timeliness – how outputs are delivered on time, accuracy – how often defective products are produced (Laitinen, 2021). By measuring the basic process criteria, the enterprise identifies problems and potential risks associated with them. Part of the identification of process risks is also the identification of causes, events or circumstances, which cause the occurrence of a process risk. Enterprises can respond to the cause of process risk with preventive activities, i.e. to focus on the problems in the process that may be the cause of the occurrence of the risk, which gives the possibility to more accurately identify the process risks (Gorzeń-Mitka, 2016; De Oliveira et al., 2024).

As part of process improvement, it is also necessary to pay attention to process risks from the prevention point of view. Assessing process risks and taking measures to manage identified risks can be considered as a tool for their improvement (Karamustafa & Cebi, 2023). A process is defined in ISO 9001:2015 as "a set of interrelated

or interacting activities which use inputs to deliver desired outputs." ISO 31000:2018 defines risk as "the effect of uncertainty on objectives" and a source of risk as "an element that alone or in combination may cause a risk". By combining the above definitions, process risk can be defined as the effect of uncertainty on the objectives and desired outputs of processes (Hudakova et al., 2023)

Systemic risk management in enterprises is referred to as Enterprise risk management (ERM). ERM is an ongoing process that is created by the enterprise's top management, responsible management structures and employees. It is implemented from a strategic level across the entire enterprise and is oriented towards all resources creating values (Zieba et al., 2022). Garcia et al. (2018), Bogodistov, Wohlgemuth (2017) talk about risk management from the overall perspective of business management. They say that it is necessary for the enterprise's management to ensure the following activities during the risk management process: Analysing, monitoring, measuring and understanding risk. Defining objectives in the field of risk mitigation of the enterprise and determining the most suitable risk mitigation strategy. Subsequently, determining and implementing the most suitable risk mitigation method for the enterprise's conditions. Evaluating the application of the enterprise's risk strategy in practice.

Part of risk management according to ISO 31000:2018 is the risk management process, which consists of definition of scope, context and criteria, risk assessment, risk treatment, communication and consultation, monitoring and review, recording and reporting. (Ferreira de Araújo Lima et al, 2020; Laitinen 2021). As part of the risk assessment, the standard requires: Risk identification: As part of risk identification, the enterprise should consider the following factors and the relationships between these factors: Tangible and intangible sources of risk, causes and events, threats and opportunities, vulnerability and capabilities, changes in external and internal contexts, indicators of emerging risks, nature and value of assets and resources, consequences and their impact on objectives, limitations of knowledge and reliability of information, time-related factors, biases, assumptions and beliefs of those involved. Risk analysis: Risk analysis should take into account factors such as: likelihood of events and consequences, nature and magnitude of consequences, complexity and connectivity, time-related factors and volatility, the effectiveness of existing controls, sensitivity and confidence levels (e.g. Wurjaningrum et al., 2023). Risk Assessment: Risk assessment involves comparing the results of a risk analysis with established risk criteria to determine where further action is required. This can lead to a decision: do nothing further, consider risk treatment options, undertake further analysis to better understand the risk, maintain existing controls, reconsider objectives (Zhang et al., 2023).

According to several experts, e.g. (Al-Nimer et al 2021; Hassel & Cedergren, 2021; Laitinen, 2021) risk management becomes a prerequisite for increasing the success of the implemented business activities of the enter-

prise also from the sustainable development point of view.

Currently, the integration of socially responsible business and risk management has an irreplaceable place as a tool for the preventive prevention of enterprise crises. On the one hand, risk management makes it possible to carry out business activities responsibly towards interested parties, because the enterprise is prepared for negative developments in the environment (Logan et al., 2021). On the other hand, socially responsible business enables a more effective assessment and reduction of risks, because by following its principles, the enterprise avoids many crisis situations (Bratianu et al., 2020). Anticipatory management and an emphasis on prevention can be implemented through the assessment of risks in individual processes and the adoption of measures to mitigate them.

By assessing process risks, the enterprise identifies possible problems during process execution, which would cause process failure in the form of interruption of process activity, reduction of process capability or performance, generated unnecessary costs, etc. (Mendling, et al., 2023). Hassel & Cedergren, (2021), Hudakova et al. (2023); Laitinen (2021) emphasize the integration of risk management into key enterprise processes. The enterprise should apply such an approach to risk management that protects its interests and taking into account the interests of the stakeholders of the enterprise. It is important that risk management becomes part of enterprise management, which is integrated into the formulation of objectives, strategy and all key enterprise processes.

## RESEARCH OBJECTIVE, METHODOLOGY AND DATA

The aim of the article is to identify, analyse and quantify the approach of enterprises to process risk assessment based on the business sector.

Empirical research was carried out in the business environment of the Slovak Republic (SR). The main criterion imposed on the enterprise was that it should carry out its main business activity in the Slovak Republic. The enterprise's approach to process risk assessment was determined using a questionnaire. Data collection was done using an established external data collection and market research agency. MNFORCE operates not only in Slovakia but also in other countries of the Visegrad Group (V4). Data collection took place in December 2023. The selection of enterprises was made from the internal database of the MNFORCE agency. Computer Assisted Web Interview was used to find out the attitudes of enterprises.

Only the owner or top manager of the enterprise could fill out the questionnaire. The questionnaire was secured so that it could not be filled out automatically by a computer. The questionnaire consisted of 12 questions. The questions were divided into two parts. The first part of the questionnaire contained questions focused on the demographic characteristics of the enterprise (business sector

- open question; enterprise size according to the number of employees - closed question). The second part of the questionnaire consisted of 10 questions (open, semi-closed questions), the aim of which was to map the approach of the enterprise's management to process risk management.

The subject of the empirical evaluation were the following statements (STA) in the questionnaire with possible answers:

- **STA 1:** Does your organization have one of the following management systems implemented according to international standards? Answer types:
  - A1: IATF 16949;
  - A2: ISO 9001;
  - A3: ISO 14001;
  - A4: ISO 45001;
  - A5: ISO 50001;
  - A6: None;
  - A7: Other;
- **STA 2:** What tools do you use to visualize and describe your processes?
  - A1: Process map;
  - A2: Process card or diagram;
  - A3: Guidelines or procedures describing processes;
  - A4: Other;
- **STA 3:** What indicators do you use to measure your processes?
  - A1: Performance of processes, productivity;
  - A2: Effectiveness of processes (Measure of achievement of process objectives);
  - A3: Process efficiency (Ratio of productivity, process results to process costs);
  - A4: Productivity of the entire enterprise;
  - A5: Economic indicators of the enterprise;
  - A6: Rate of achievement of the enterprise's objectives;
  - A7: Other;
- **STA 4:** In which processes do you assess risks (possible problems that may occur during the execution of the processes)?
  - A1: Production processes / service provision processes;
  - A2: Quality control;
  - A3: Maintenance;
  - A4: Metrology;
  - A5: Shopping;
  - A6: Human resource management;
  - A7: Economics, accounting;
  - A8: Management of the organization - setting strategy, objectives, policies, approving decisions;
  - A9: Planning;
  - A10: Monitoring and reporting to management;
  - A11: Requirements management;
  - A12: Nonconformity management;
  - A13: Documentation management;
- A14: We assess the risks to the enterprise as a whole;
- A15: Other;
- **STA 5:** How often do you assess process risks?
  - A1: At every change, planning, nonconformity, indicator fluctuation, other stimulus;
  - A2: Annually;
  - A3: Half-yearly;
  - A4: Quarterly;
  - A5: Monthly;
  - A6: At irregular intervals according to the instructions of the worker responsible for assessing process risks;
  - A7: Other;
- **STA 6:** What methods do you use to identify process risks?
  - A1: Brainstorming;
  - A2: Decomposition of the process (breakdown of the process into individual elements for which risks are identified);
  - A3: Decomposition of risks (breakdown of identified risks into risk factors and events);
  - A4: Analysis of process functioning (based on results, indicators);
  - A5: Event or fault tree analysis;
  - A6: Ishikawa diagram;
  - A7: Risk identification matrix;
  - A8: According to experience;
  - A9: Other;
- **STA 7:** What criteria do you use to analyse process risks?
  - A1: Likelihood of risk occurrence;
  - A2: Consequence (impact) of the risk;
  - A3: Detection (discoverability) of risk;
  - A4: Economic impact of risk;
  - A5: We use process FMEA;
  - A6: Other;
- **STA 8:** How do you evaluate process risks?
  - A1: Rate of risk by calculation;
  - A2: Risk level according to the risk assessment matrix;
  - A3: Possible scenarios;
  - A4: Acceptability of the risk (tolerable, acceptable, unacceptable);
  - A5: Effectiveness of risk management measures;
  - A6: Efficiency of risk management measures; Economic analysis of risks;
  - A7: KRI (Key Risk Indicators) We use process FMEA;
  - A8: Other;
- **STA 9:** What are the most common problems encountered in your processes? Please mark as a percentage (0-100%), the most common problems associated with:
  - A1: Reliability (how often the process fails);
  - A2: Accuracy, capability (how often are the outputs nonconforming);
  - A3: Quantity, productivity (how much the process produces);

- A4: Timeliness (adherence to the time schedule);
- A5: Process costs (process resources).
- **STA 10:** What are the most common causes of problems that occur in your processes? Please indicate the percentage (0-100%) of the most common causes associated with:
  - A1: Human factor;
  - A2: Malfunctions of devices, tools, equipment;
  - A3: Problems with documents, information;
  - A4: Delivery of inputs – low-quality inputs;
  - A5: Delivery of inputs - late deliveries;
  - A6: Inadequate quality control;
  - A7: Inadequate training of workers;
  - A8: Insufficient process resources;
  - A9: By force majeure.

The authors formulated the following research questions (RQ) and hypotheses (H):

- **RQ1:** Which tools for visualization and description of processes are used the most in Slovak enterprises?
- **RQ2:** For which processes do Slovak enterprises most often assess risks?
- **RQ3:** Do enterprises operating in the service business sector use different methods for identifying, analysing and evaluating process risks than enterprises operating in the industry sector?

**H:** There are statistically significant differences in identification (H\_A); analysis (H\_B) and evaluation (H\_C) of process risk between enterprises operating in services and industry sector.

The following statistical methods were used to evaluate the research questions: absolute frequency of the variable; relative frequency of the variable; cumulative absolute and relative frequency, simple sorting of the variable; sorting by two variables; creation of contingency tables; graphic visualization of variables using: bar chart, pie chart, histogram. The Chi-square test method was used to determine significant differences in respondents' attitudes to selected variables. The prerequisites for its application are: (1) the absolute frequency in more than 80% of the categories is greater than 5; (2) theoretical frequency in each category more than 1. Level of significance ( $\alpha$ ) was chosen 0.05.

The questionnaire was filled out by 353 (n – total number) enterprises operating in the Slovak Republic. From the total sample of enterprises, 218 (61.8%) were small enterprises (up to 50 employees); 81 (22.9%) medium enterprises (from 50 to 250 employees) and 54 (15.3%) large enterprises (more than 250 employees). Structure of enterprises according to the business sector in which they operate: 129 (36.5%) services; 107 (30.5%) industry; 52 (14.7%) trade; 25 (7.1%) tourism; 25 (7.1%) manufacturing and 15 (4.3%) other businesses (e.g. transport, agriculture).

## RESULTS

Enterprises could mark multiple answers to statement STA 1. The overall structure of the enterprises' answers to the STA1 statement is as follows: A1 – 21 (5.9%); A2 – 122 (34.6%); A3 – 64 (18.1%); A4 – 49 (13.9%); A5 – 32 (9.1%); A6 – 151 (42.8%) and A7 – 5 (1.4%). Among the most frequently implemented management systems that Slovak enterprises have in place are ISO 9001 (34.6%) and ISO 14001 (18.1%). The following table (see table 1) compares the attitudes of enterprises between the two most numerous business sectors: industry and services.

Table 1: Contingency table of answers to STA 1 by selected business sector

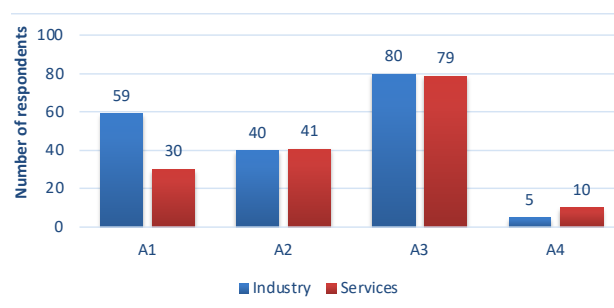
STA 1	Business sector	
	Industry	Services
A1	14	5
A2	56	39
A3	30	20
A4	18	18
A5	8	13

Source: own empirical data

The results of the chi-square test did not show significant differences (Chi-square = 6.271; p-val. = 0.180) between enterprises operating in the industry and services sector in the implementation of management systems according to international standards (see tab. 1).

The structure of enterprises' answers to STA 2 is as follows: A1 – 113 (32.0%); A2 – 106 (30.0%); A3 – 239 (67.7%) and A4 – 14 (4.0%). To visualize and describe their processes, up to 67.7% of Slovak enterprises use guidelines or procedures describing processes (A3). The comparison of the absolute numbers of enterprises with respect to the business sector (industry, services) for the statement STA 2 is the subject of fig. 1.

Figure 1: Structure of answers to STA 2 according to the selected business sector



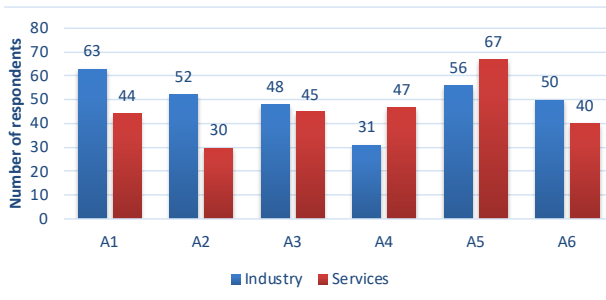
Source: own empirical data

The results of the chi-square test showed statistically significant differences (Chi-square = 9.507; p-val. = 0.023) between enterprises operating in the industry and services sector in the use of tools for visualization and description of their processes. The business sector factor is statistically significant. Enterprises operating in industry to a greater extent (47.6%; see fig. 1) use a process map to visualize and describe their processes compared

to enterprises operating in the service business sector (41.1%; see fig. 1).

Slovak enterprises use the following indicators (STA 3) to measure their processes: A1 – 156 (44.2%); A2 – 96 (27.2%); A3 – 128 (36.3%); A4 – 123 (34.8%); A5 – 176 (49.9%); A6 – 117 (33.1%) and A7 – 12 (3.4%). The three most frequently used indicators for measuring processes in Slovak enterprises include: economic indicators of the enterprise (A5; 49.9%); enterprise performance and productivity (A1; 44.2%) and process efficiency (A3; 36.3%).

Figure 2: Structure of answers to STA 3 according to the selected business sector



Source: own empirical data

The results (see fig. 2) of the chi-square test showed statistically significant differences (Chi-square = 13.087; p-val. = 0.011) between enterprises operating in the industry and services sector in the use of indicators to measure their processes. The business sector factor is statistically significant. Enterprises operating in industry use process performance (A1; 58.9%) and process effectiveness (A2; 48.6%) to a greater extent than enterprises operating in services.

Tab. 2 shows the number (absolute/relative) of Slovak enterprises which assess risks in selected processes.

Table 2: Number of enterprises according to the type of answer to STA 4.

TA	Nr.	RF	TA	Nr.	RF
A1	122	34.60%	A8	74	21.00%
A2	148	41.90%	A9	50	14.20%
A3	77	21.80%	A10	56	15.90%
A4	54	15.30%	A11	61	17.30%
A5	116	32.90%	A12	63	17.80%
A6	101	28.60%	A13	77	21.80%
A7	119	33.70%	A14	3	0.80%

Note: TA – type of answer, Nr. – number of respondents, RF – relative frequency.

Source: own empirical data

Tab. 2 shows that Slovak enterprises assess risks most often in the following processes: 148 (41.9%) quality control (A7); 122 (34.6%) production processes/ service provision processes (A1); 119 (33.7%) economics, accounting (A5). There are no statistically significant differences between enterprises operating in the industry and services sectors in the structure of processes in which risks are assessed (Chi-square = 4.659; p-val. = 0.097).

The frequency of assessment of process risks in the sample set of Slovak enterprises is the subject of tab. 3.

Table 3: Number of enterprises according to the type of answer to STA 5

TA	Nr.	RF
A1	100	28.30%
A2	82	23.20%
A3	55	15.60%
A4	71	20.10%
A5	52	14.70%
A6	42	11.90%

Note: TA – type of answer, Nr. – number of respondents, RF – relative frequency.

Source: own empirical data

Tab. 3 shows that Slovak enterprises assess risks with every change, planning, disagreement, indicator fluctuation (100; 28.3%); annually (82; 23.2%) and quarterly (71; 20.1%). There are no statistically significant differences in the structure of risk assessment frequency between enterprises operating in the industry and services sector (Chi-square = 1.718; p-val. = 0.423).

The methods used by Slovak enterprises to identify process risks is the subject of tab. 4.

Table 4: Number of enterprises according to the type of answer to STA 6

TA	Nr.	RF	TA	Nr.	RF
A1	116	32.90%	A5	42	11.90%
A2	57	16.10%	A6	31	8.80%
A3	49	13.90%	A7	79	22.40%
A4	105	29.70%	A8	165	46.70%

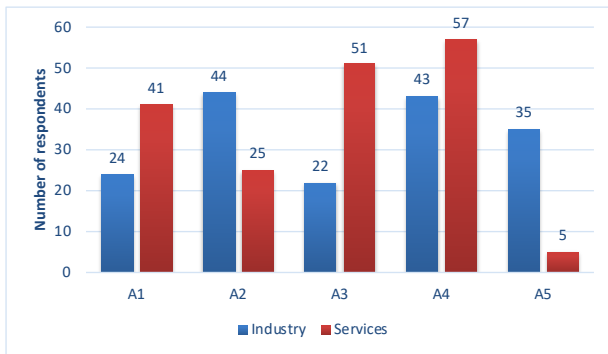
Note: TA – type of answer, Nr. – number of respondents, RF – relative frequency.

Source: own empirical data

Tab. 4 shows that Slovak enterprises most often use the following methods to identify process risks: according to experience (165; 46.7%); brainstorming (116; 32.9%) and analysis of process functioning (based on results and indicators; 105; 29.7%). There are statistically significant differences between enterprises operating in the industry and services sectors in the structure of the methods they use to identify process risks (Chi-square = 6.876; p-val. = 0.321). Enterprises in the service sector use personal experience to a greater extent to identify process risks (65; 50.4%) compared to enterprises operating in the industry sector (36; 33.6%). The business sector factor is statistically significant. Hypothesis H\_A was accepted.

The methods used by Slovak enterprises to analyse process risks according to the selected business sector is the subject of fig. 3.

Figure 3: Structure of answers to STA 7 according to the selected business sector



Source: own empirical data

Fig. 3 shows that there are statistically significant differences between Slovak enterprises operating in the industry and services sector in the structure of the methods they use when analysing process risks (Chi-square = 37.734; p-val. = 0.000). Enterprises in the service sector use risk detection (detectability) to a greater extent to analyse process risks (40; 31.1%) compared to enterprises operating in the industry sector (14; 13.8%). On the other hand, enterprises operating in the industrial sector use process FMEA to a greater extent to analyse process risks (32.7%) compared to enterprises operating in the service sector (5; 3.8%). The business sector factor is statistically significant. Hypothesis H<sub>B</sub> was accepted. The methods used by Slovak enterprises to evaluate process risks are the subject of tab. 5.

Table 5: Number of enterprises according to the type of answer to STA 8

TA	Nr.	RF	TA	Nr.	RF
A1	65	18.40%	A6	73	20.70%
A2	81	22.90%	A7	101	28.60%
A3	112	31.70%	A8	32	9.10%
A4	77	21.80%	A9	49	13.90%
A5	104	29.50%			

Note: TA - type of answer, Nr. - number of respondents, RF - relative frequency.

Source: own empirical data

Tab. 5 shows that Slovak enterprises most often use the following methods to evaluate process risks: possible scenarios (112; 31.7%); effectiveness of risk management measures (104; 29.5%) and economic analysis of risks (101; 28.6%). There are statistically significant differences between enterprises operating in the industry and services sectors in the structure of the methods they use in evaluating process risks (Chi-square = 17.983; p-val. = 0.000). Enterprises in the service sector use scenarios (A3; 31.8%) and economic risk analysis (A7; 39.5%) to evaluate process risks to a greater extent than operating in the industry sector (A3: 22.4%/ A7: 20.6%). On the other hand, up to 41.1% of enterprises operating in industry use the effectiveness of risk management measures (A5) compared to 19.4% of enterprises operating in

services. The business sector factor is statistically significant. Hypothesis H<sub>C</sub> was accepted.

The following problems occur in the processes of Slovak enterprises (see tab. 6), whose presence in the enterprise could be expressed as a percentage (0-100%).

Table 6: number of according to the type of answer in case of STA 9

STA 9	A1 NR (%)	A2 NR (%)	A3 NR (%)	A4 NR (%)	A5 NR (%)
0 %	9.90%	11.60%	12.50%	13.00%	11.90%
10 %	27.50%	24.40%	26.90%	22.70%	22.40%
20 %	22.70%	18.70%	17.60%	19.30%	23.20%
30 %	8.80%	13.30%	13.60%	11.00%	10.20%
40 %	7.40%	9.30%	5.10%	7.10%	6.20%
50 %	8.50%	10.20%	9.30%	11.60%	11.60%
60 %	4.00%	3.70%	5.40%	5.70%	4.50%
70 %	5.90%	5.10%	3.40%	3.40%	4.50%
80 %	2.30%	1.40%	2.80%	4.00%	2.80%
90 %	1.70%	1.10%	1.70%	0.60%	1.10%
100 %	1.40%	1.10%	1.70%	1.70%	1.40%

Source: own empirical data

The results (see tab. 6) show that more than 50% of respondents stated that the frequency of process failure (or its reliability) occurs in 10%-20% of all processes. More than 10% of Slovak enterprises reported problems with accuracy and capability (nonconforming outputs) in 50% of all processes. Problems with quantity, productivity (how much the process produces) were reported by more than 5% of Slovak enterprises in 60% of all processes. More than 4% of Slovak enterprises reported problems with meeting the time schedule (whether the outputs are on time) in 80% of all processes. Problems with process costs (process resources) were reported by more than 11% of Slovak enterprises in 50% of all processes.

Mapping the most frequent causes of problems that occur in the processes of Slovak enterprises is the subject of tab. 7.

Table 7: number of according to the type of answer in case of STA 10

STA 10	A1 Nr (%)	A2 Nr (%)	A3 Nr (%)	A4 Nr (%)	A5 Nr (%)
0 %	5.90%	16.70%	15.90%	20.40%	19.80%
10 %	21.50%	28.90%	28.00%	29.70%	24.90%
20 %	20.40%	22.40%	17.80%	18.10%	21.50%
30 %	13.00%	8.80%	9.10%	10.50%	9.60%
40 %	5.70%	5.70%	11.30%	3.40%	4.50%
50 %	8.50%	5.40%	6.20%	7.10%	7.40%
60 %	4.80%	4.20%	3.70%	2.80%	3.40%
70 %	9.90%	3.70%	3.70%	4.20%	3.40%
80 %	4.20%	2.80%	1.40%	2.00%	3.40%
90 %	2.50%	1.40%	1.70%	1.70%	1.70%
100 %	3.40%	1.10%	1.10%	0.00%	0.30%

	A6 Nr (%)	A7 Nr (%)	A8 Nr (%)	A9 Nr (%)
0 %	18.10%	22.90%	23.50%	21.00%
10 %	31.40%	25.50%	24.60%	25.50%
20 %	17.80%	17.30%	18.70%	19.00%
30 %	8.50%	8.50%	9.30%	11.30%
40 %	4.00%	5.90%	5.70%	6.20%
50 %	6.20%	7.10%	7.10%	5.10%
60 %	5.90%	3.70%	4.50%	1.40%
70 %	4.80%	3.70%	2.50%	4.00%
80 %	1.10%	3.10%	2.50%	1.40%
90 %	0.80%	2.00%	0.80%	3.70%
100 %	1.10%	0.30%	0.60%	1.40%

Note: Nr. – Number of respondents; A1,..., A9 – Type of answer.

Source: own empirical data

The results show (see tab. 7) that one out of ten enterprises is the cause of the occurrence of problems in 40-50% of processes precisely because of the malfunction of equipment, tools and equipment. More than 60% of enterprises stated that the human factor is the cause of problems in up to 30% of all processes. More than 10% of enterprises said that problems with documentation and information are the cause of problems in 40% of all processes. Late deliveries, insufficient quality control, insufficient training of workers are other causes of the occurrence of problems in processes, which, however, have a lower intensity compared to the other investigated causes.

## DISCUSSION

The findings achieved in the sample set (n = 353) of Slovak enterprises can be summarized as follows.

The results show that more than four out of ten enterprises interviewed do not have a single management system implemented according to international standards. The business sector is not a significant factor which would play an important role in the implementation of the management system in Slovak enterprises. Guidelines or procedures describing processes (67%) are most often used together with process maps (30%) in the conditions of Slovak enterprises to visualize and describe processes. Enterprises operating in industry sector use a "process map" to describe and visualize their processes to a greater extent than enterprises operating in service sector. The business sector is an important factor that would play an important role in the visualization and description of processes in Slovak enterprises.

The business sector is an important factor that plays a role in the use of indicators to measure processes in Slovak enterprises. Enterprises in service sector use productivity of the enterprise (A4; 36.4%) and economic indicators (A5; 51.9%) to a greater extent compared to enterprises operating in the industry sector.

Risk assessment most often takes place in processes associated with quality control; production processes and economics/accounting in enterprises. Most often, enterprises perform the assessment of process risks with every change, planning or fluctuation of the indicator (28%) and once a year (23%). There are no significant differences between enterprises in service and industry sector in the above-mentioned questions.

Another interesting finding is that one out of ten interviewed enterprises stated that the human factor is the cause of problems in 70% of processes. In three enterprises out of 100, the human factor is the cause of problems in every process. In almost 70% of enterprises, it was found that the malfunction of devices, tools and equipment is the main cause of problems in up to 20% of all processes. Almost 70% of enterprises said that documentation and information are the cause of problems in up to 10% of all processes. On the one hand, 7% of enterprises stated that low-quality inputs are the cause of problems in 50% of all processes, on the other hand, 80% of enterprises stated that low-quality inputs are the cause of problems in a maximum of 30% of all processes.

Problems with reliability in up to 70% of all processes occur in 5.9% of Slovak enterprises. A third of respondents stated that problems with accuracy and capability (nonconforming outputs) occur in 20-30% of all processes. Every fourth respondent stated that problems with quantity, productivity (how much the process produces) occur in 10-20% of all processes. Every other enterprise stated that problems with timeliness (whether outputs are on time) occur in 10-30% of all processes. Every third enterprise stated that problems with process costs (process resources) occur in 0-10% of all processes.

Other surveys conducted at the Department of Crisis Management of the Faculty of Security Engineering show that the application of risk management in enterprises in Slovakia and abroad is at a low level. Enterprises often do not have a specifically designated person responsible for risk management. Risk management is the responsibility of the owner of the enterprise or the top manager, who has been assigned responsibility for risk management in addition to his main job. Enterprises do not have an authorized person for risk management (22.5%). The second most frequent answer was that the person responsible for risk management is the owner of the enterprise (20.8%) and in 19.2% of cases, according to the survey, the owners of individual processes are responsible for risk management. In only 10.5% of cases, specialists in the position of risk managers (for example, analysts) were responsible for risk management. The main barriers to the application of risk management are lack of resources, lack of knowledge of procedures and methods, lack of understanding of roles, responsibilities and authority in risk management, weak motivation of personnel, lack of reason, sense of dealing with risks (Al-Nimer et al., 2021; Logan et al., 2021; Hudakova et al. 2023). On the other hand, enterprises are interested in learning about risk management. One of the questions in the surveys was whether enterprises would welcome the



possibility of increasing/expanding awareness of the issue of risk management and Business continuity management (BCM) within their enterprise. 65% of enterprises said that they would welcome an increase in awareness of this issue (Avilova et al., 2017; Laitinen, 2021; Zieba et al, 2022). This question was followed by another question, in which form enterprises would welcome the possibility of raising/expanding awareness in this area. 14.5% of enterprises would welcome the creation of a position of risk manager or business continuity manager, 35.4% of enterprises would welcome employee training in the area of risk management and BCM, 27.3% of enterprises would welcome consulting with an external employee in the area of risk management and BCM. 18.7% of enterprises would welcome standardization in the area of risk management and BCM.

## CONCLUSION

The aim of the article is to identify, analyse and quantify the approach of enterprises to process risk assessment based on the business sector. The scientific article contains several interesting findings. Answer to the research question RQ1: In order to visualize and describe processes, two thirds of Slovak enterprises use guidelines or process procedures. A third of enterprises use a process map. Answer to the research question RQ2: Slovak enterprises mainly use process risk assessment in quality control (40%); production processes/processes associated with the provision of services (34%) and economy, accounting (33%). Enterprises most often use their own experience (45%) and brainstorming (33%) to identify process risks. To a greater extent, own experience is implemented in the identification of process risks in service sector compared to enterprises in industry. To analyse process risks, enterprises in the service sector most often use risk detection (discoverability) (31%) and in the industry sector most often process FMEA (33%). To evaluate process risks, enterprises in the service sector most often use scenario analysis (32%), and in the industry sector, the effectiveness of measures is most often used (40%). The business sector is an important factor that determines the choice of method for identification, analysis and evaluation of process risks. From the above findings, it follows that enterprises in the service sector use different methods in identifying, analysing and evaluating process risks. Answer to research question RQ3 – Yes.

Carrying out scientific research analysing process risks in the business environment of the Slovak Republic has certain limitations. The research was carried out in only one country of the European Union. The sample of respondents was 353 enterprises. It would certainly be appropriate to repeat the data collection on another sample of respondents and verify the results achieved in this research. The research included only two demographic questions - the business sector and the size of the enterprise. The result may be less representativeness of the sample set. Data collection was carried out by an external agency using the CAWI method, which also contains certain limitations (e.g. recording the behaviour of respondents face-to-face, etc.).

The effort of the research team is to constantly raise awareness of risk management and apply it through responsible process managers in enterprises in Slovakia. The results of the project can be used in Slovakia and abroad for:

- Enterprises whose management is interested in improving their processes. Greater emphasis on process risks will help them not only to prevent business mistakes, but also to increase the overall success of the enterprise.
- Process managers who are interested in increasing their knowledge and skills in the field of process risk management.
- Students and professional public. The results are an enrichment not only for the professional public but will also contribute to the improvement of teaching quality and better preparation of graduates for the needs of practice.

The processed results presented in the article are mainly oriented to the assessment of process risks in the enterprise's quality management system. From the further research point of view in the addressed issue, the authors of the article will focus on the assessment of process risks in connection with other management systems, e.g. environmental management system, OHS management system as well as for assessing project risks in the enterprise. It will be very important to focus attention especially on the analysis and evaluation of process risk indicators for individual enterprise processes, which would more accurately indicate the occurrence of process risks.

Copyright © European Center of Economic and Social Research (Slovakia). This is an Open Access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



## REFERENCES

1. Al-Nimer, M.; Abbadi, S. S.; Al-Omush, A., & Ahma, H. (2021). Risk Management Practices and Firm Performance with a Mediating Role of Business Model Innovation. Observations from Jordan, *Journal of risk and financial management*, 14 (3), 113. <https://doi.org/10.3390/jrfm14030113>
2. Alem, D., Oliveira, F., & Peinado, M. C. R. (2020). A practical assessment of risk-averse approaches in production lot-sizing problems. *International journal of production research*, 58 (9), 2581-2603. <https://doi.org/10.1080/00207543.2019.1620364>
3. Avilova, T. V., Voytolovskiy, N. V., Dikareva, V. A., & Chernysheva, A. M. (2017). Efficiency of applying risks management systems at industrial enterprises under market conditions. *Journal of Applied Economic Sciences*, 12(3), 766-771.
4. Bogodistov, Y., & Wohlgemuth, V. (2017). Enterprise risk management: a capability-based perspective. *Journal of Risk Finance*, 18(3), 234–251. <https://doi.org/10.1108/JRF-10-2016-0131>
5. Bratianu, C. ; Nestian, A.S. ; Tita, S.M. ; Voda, A.I. ; Guta, A.L. (2020). The impact of knowledge risk on sustainability of firms. *Amfiteatru Economic*, 22(55), 639–652. <https://doi.org/10.24818/EA/2020/55/639>
6. Brocke, J., & Sinnl, T. (2011). Culture in business process management: a literature review. *Business Process Management Journal*, 17(2), 357-378. <https://doi.org/10.1108/14637151111122383>
7. De Oliveira, U.R., Dias, G.C., & Fernandes, V.A. (2024). Evaluation of a conceptual model of supply chain risk management to import/export process of an automotive industry: an action research approach. *Operations Management Research*, 17 (1), 201-219. <https://doi.org/10.1007/s12063-023-00422-8>
8. Dillen, Y., & Vandekerckhof, P. (2021). Does the sector matter? An analysis of high-growth firms and industry growth rates. *Journal of Small Business and Enterprise Development*, 28 (6), 927-945. <https://doi.org/10.1108/JSBED-02-2020-0053>
9. ENISA (2024). Integration of Risk Management with Business Processes. Retrieved: March 15, 2024, from <https://www.enisa.europa.eu/topics/risk-management/current-risk/business-process-integration>
10. FERMA (2024). The role of risk management in corporate resilience. Retrieved: March 12, 2024, from <https://www.ferma.eu/publication/the-role-of-risk-management-in-corporate-resilience/>
11. Fraser, J. R. S., & Simkins, B. J. (2016). The challenges of and solutions for implementing enterprise risk management. *Business Horizons*, 59(6), 689–698. <https://doi.org/10.1016/j.bushor.2016.06.007>
12. Ferreira de Araújo Lima, P., Crema, M., & Verbano, C. (2020). Risk management in SMEs: A systematic literature review and future directions. *European Management Journal*, 38 (1),78-94. <https://doi.org/10.1016/j.emj.2019.06.005>
13. Fosso Wamba, S., & Mishra, D. (2017). Big data integration with business processes: a literature review. *Business Process Management Journal*, 23 (3), 477-492. <https://doi.org/10.1108/BPMJ-02-2017-0047>
14. Garcia, Y.M., Muñoz, M., Mejía J., Gasca G.P., & Mireles A. (2018). Application of a risk management tool focused on helping to small and medium enterprises implementing the best practices in software development projects. *Advances in Intelligent Systems and Computing*, 746, 429-440.
15. Gorzeń-Mitka I. (2016). Leading Risk Management Determinants of Small and Medium-Sized Enterprises (SMEs), An Exploratory Study in Poland. *Entrepreneurship, Business and Economics*. 1 (1), 289–98, [https://doi.org/10.1007/978-3-319-27570-3\\_23](https://doi.org/10.1007/978-3-319-27570-3_23)
16. Gengatharan, R., Al Harthi, E.S., & Al Malki, S.S. (2020). Effect of Firm Size on Risk and Return: Evidences from Sultanate of Oman. *European Journal of Business and Management*, 12 (9), 62–71. <https://doi.org/10.7176/EJBM/12-9-08>
17. Hassel, H, & Cedergren, A. (2021). Integrating risk assessment and business impact assessment in the public crisis management sector. *International journal of disaster risk reduction*, 56, 102136. <https://doi.org/10.1016/j.ijdrr.2021.102136>
18. Hudakova, M., Kardos, P., Dvorský, J., Afful, C.R., & Kloudova, J. (2023). Management of Operational Risk in the Context of Financial Performance of SMEs. *Systems*, 11(8), <https://doi.org/10.3390/systems11080408>
19. Hudakova, M., Gabrysova, M., Petrakova, Z., Buganova, K., & Krajcik, V. (2021). The perception of market and economic risks by owners and managers of enterprises in the V4 countries. *Journal of Competitiveness*, 13(4), 60–77. <https://doi.org/10.7441/joc.2021.04.04>
20. Ireta-Sanchez, J.M. (2023). From establishment to scaling up of an SME in the IT sector: deliberate and emergent strategies as critical essentials for the sustainable business model. *Journal of Entrepreneurship in Emerging Economies*, <https://doi.org/10.1108/JEEE-02-2023-0048>
21. Institute of Risk Management (2024). The Institute of Risk Management, Risk Culture. Retrieved: March 12, 2024, from <https://www.theirm.org/training/public-courses/risk-culture/>
22. Karamustafa, M., & Cebi, S. (2023). A Novel Approach to Assess Occupational Risks at Welding Processes in Shipbuilding Industry. *Journal of multiple-valued logic and soft computing*, 41 (3-5), 377-406.
23. Khan, K. A., Čera, G., & Nėtek, V. (2019). Perception of the Selected Business Environment Aspects by Service Firms. *Journal of Tourism and Services*, 10 (19), 111–127. <https://doi.org/10.29036/jots.v10i19.115>

24. Ključnikov , A., Civelek, M., Klimeš, C., & Farana, R. (2022). Export risk perceptions of SMEs in selected Visegrad countries. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 17 (1), 173–190. <https://doi.org/10.24136/eq.2022.007>
25. Laitinen, E. K. (2021). Analyzing business-failure-process risk: evidence from Finland. *Journal of financial reporting and accounting*, 19 (4), 571-595. <https://doi.org/10.1108/JFRA-06-2020-0164>
26. Logan, T.M., Aven, T., Guikema, S., & Flage, R. (2021). The role of time in risk and risk analysis: Implications for resilience, sustainability, and management. *Risk Analysis*, 41(11), 1959–1970. <https://doi.org/10.1111/risa.13733>
27. Lopez, J.R.C. (2021). How Can Enterprise Risk Management Help in Evaluating the Operational Risks for a Telecommunications Company? *Journal of Risk Financial Management*, 14 (3), 139. <https://doi.org/10.3390/jrfm14030139>
28. Mendling, J. et al. (2018). Blockchains for Business Process Management – Challenges and Opportunities. *ACM Transactions on Management Information Systems*, 9 (1), 1-16. <https://doi.org/10.1145/3183367>
29. Virglerova, Z. (2018). Differences in the Concept of Risk Management in V4 Countries. *International Journal of Entrepreneurial Knowledge*, 6 (2), 100-109. <https://doi.org/10.2478/ijek-2018-0017>
30. Wurjaningrum, F., Kartika, N., Purmiyati, A. (2023). How to Mitigate the SMEs Supply Chain Risk During the Pandemic in Indonesia with Failure Mode and Effect Analysis? *Lecture Notes in Networks and Systems*, 924, 11-21. [https://doi.org/10.1007/978-3-031-53998-5\\_2](https://doi.org/10.1007/978-3-031-53998-5_2)
31. Zhang, J.A., Bai, T., & O’Kane, C. (2023). How political connections affect entrepreneurial risk-taking in SMEs: A symmetric assessment and a configurational approach. *International Small Business Journal: Researching Entrepreneurship*, 41 (7), 685-713. <https://doi.org/10.1177/02662426221122845>
32. Zieba, M.; Durst, S., & Hinteregger, C. (2022). The impact of knowledge risk management on sustainability. *Journal of Knowledge Management*, 26 (11), 234-258. <https://doi.org/10.1108/JKM-09-2021-0691>