

## Evaluating market opportunities and threats pre- and post-COVID-19: Evidence from Slovak Republic

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### Abstract

**Purpose:** The purpose of this paper is to compare how Slovak companies responded to market opportunities and threats in the pre- and post-COVID-19 survey years and to analyze the role of the internal environment in shaping these responses.

**Design/methodology/approach:** The research is based on two surveys of Slovak enterprises (489 in 2016 and 573 in 2021), applying correlation and regression analyses to evaluate responses to external opportunities and threats and their relationship to internal organizational factors.

**Findings:** The study shows that firms' responsiveness to opportunities and threats is mechanism-dependent rather than uniform, varying across firm size, maturity, and sector. Opportunity responsiveness is strongly associated with internal capabilities—particularly strategic alignment and trend analysis—and drives innovation in processes, automation, and informatization. In contrast, under recessionary conditions, threat responsiveness also stimulates innovation, but through a necessity-driven mechanism that operates largely independently of internal capability levels.

**Research limitations/implications:** The study is limited to Slovak enterprises and is based on two independent cross-sectional samples with differing sectoral representation in 2016 and 2021, which restricts causal interpretation of the results. In addition, the analysis relies on self-reported managerial perceptions. Future research could extend the comparison to other EU countries and longer timeframes to assess long-term effects.

**Originality/value:** This paper contributes to strategic management and innovation literature by providing empirical evidence from an emerging innovator economy. It shows that both opportunity recognition and threat responsiveness drive innovation, especially in turbulent contexts such as COVID-19.

**Keywords:** COVID-19, Slovakia, Opportunity recognition, Strategic response, Innovation, Business environment

**Jel Codes:** O33, O44, M21

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## 1. Introduction

The outbreak of the COVID-19 pandemic in 2020 led to an overall economic downturn. According to Verwey and Monks (2021), real GDP fell by 6.1%, which was more than the decline during the global financial crisis. This decline highlighted the vulnerability of global and regional economies to sudden systemic shocks (Baldwin & Di-Mauro, 2020). However, the EU reacted quickly and supported Member States' businesses thanks to its instruments. It was not just support in the form of liquidity, but also support through short-time work programs. These mechanisms, such as the SURE instrument (Support to mitigate Unemployment Risks in an Emergency), were aimed at preserving employment and preventing mass layoffs (European Commission, 2020).

Before the COVID-19 pandemic, the GDP in the EU in 2018 was estimated at 18.8 trillion dollars (expressed in USD for international comparability), which meant an increase of 1.4 trillion dollars from 2017. The amount of this GDP was caused by the production of all finished goods and services (Orion Market Research Private Limited, 2020).

Rather than viewing the COVID-19 pandemic merely as a sequence of restrictive measures, recent strategic management literature conceptualizes the crisis as a period of extreme environmental turbulence, characterized by high uncertainty, rapid change, and disrupted market mechanisms (Hitt et al., 2020; Wenzel et al., 2021).

Significant changes in the business environment occurred as a result of declines in demand, which was particularly specific in some sectors (entertainment or travel) as well as problems in the field of supply chains, whereby many suppliers had to limit or close their operations (Rio-Chanona et al., 2020). These effects were not evenly distributed—while the travel and tourism industries nearly collapsed, some digital and logistics sectors experienced growth due to the shift in consumer behaviour (OECD, 2021).

In April 2020, the number of days spent in accommodation decreased by 96%, turnover in accommodation and catering facilities by 58%, exports by 24% and industrial production by 19%. In the 3rd quarter as a result of the measures introduced, government debt reached the level of 89% of GDP (Eurofound, 2021). These macroeconomic developments illustrate the scale of disruption faced by firms and underscore the strategic challenge of responding to rapidly changing external conditions.

As for Slovakia, the second wave of the pandemic did not have as great an impact on its business economy as the first wave. It affected selected industries such as restaurants, transport, retail, etc. The decline in macroeconomic indicators in the second wave was not large, as the decline in industry and industrial production was not so dramatic (SBA, 2021). This suggests that businesses had partially adapted to the new conditions, demonstrating increased resilience and the effectiveness of some earlier interventions (World Bank, 2021).

From a strategic management perspective, such adaptation differences point to heterogeneous firm capabilities in sensing environmental changes, responding to opportunities and threats, and reconfiguring internal resources. This study is therefore theoretically grounded in the concept of strategic agility, which explains how firms navigate turbulent environments through continuous environmental scanning, rapid decision-making, and flexible strategic responses (Arbussa et al., 2017; Clauss et al., 2019). By focusing on internal organizational conditions, strategic responsiveness, and innovation behavior under crisis conditions, this study contributes to the literature on intangible capital by empirically examining how non-financial, intangible organizational resources—such as strategic alignment, organizational flexibility, and situational awareness—shape firms' adaptive capacity in turbulent environments.

Slovakia represents a theoretically relevant research context as an emerging innovator economy characterized by moderate innovation performance, strong dependence on foreign-owned firms, and limited endogenous R&D capacity. Studying firm responsiveness in such a context enables insights into how internal environments shape strategic reactions under constrained conditions, which are comparable to many Central and Eastern European economies.

Although a growing body of literature has examined firm responses to the COVID-19 crisis, existing empirical studies remain fragmented and conceptually limited in several respects. A dominant stream of research focuses primarily on firm survival, performance outcomes, or short-term crisis coping strategies, such

as liquidity management, layoffs, or business continuity measures (Breier et al., 2021; Shafi et al., 2020; Bartik et al., 2020). While these studies provide valuable descriptive insights into how firms reacted during the crisis, they offer limited theoretical explanation of the underlying organizational mechanisms that enable firms to sense environmental changes and respond strategically to opportunities and threats over time (Wenzel et al., 2021). More importantly, prior research—particularly within the dynamic capabilities and strategic agility literature—tends to assume that internal capabilities symmetrically drive firms' responses to both opportunities and threats. However, empirical studies rarely distinguish whether these responses are underpinned by the same or fundamentally different mechanisms.

In addition, existing research predominantly conceptualizes firm responses as proactive and capability-driven, while paying limited attention to reactive, necessity-driven responses that emerge under crisis conditions. This creates a conceptual gap in understanding how different types of environmental stimuli translate into distinct forms of firm behavior.

Moreover, many empirical studies examine crisis responses as isolated or one-off reactions, without embedding them in a broader strategic management framework that would explain how firms purposefully reconfigure internal resources and capabilities under prolonged environmental turbulence (Hitt et al., 2020; Ritter & Pedersen, 2020). As a result, the role of internal organizational conditions as intangible resources shaping firms' adaptive capacity remains underexplored, particularly in comparative analyses across pre- and post-crisis periods.

To address these limitations, this study draws explicitly on the dynamic capabilities perspective, which conceptualizes firm adaptation as a systematic process of sensing environmental changes, seizing emerging opportunities, and reconfiguring internal resources to sustain competitiveness under uncertainty (Teece et al., 1997; Teece, 2007). Strategic agility is treated in this study as a behavioral manifestation of dynamic capabilities, reflecting observable organizational responses to opportunities and threats rather than latent or self-reported capabilities (Arbussa et al., 2017; Duchek, 2020). While this perspective provides a strong theoretical foundation for understanding firm adaptation, this study extends it by examining whether these capabilities operate uniformly across different types of environmental stimuli. In particular, it investigates whether opportunity-driven and threat-driven responses reflect distinct underlying mechanisms, thereby addressing an important limitation in existing research.

The purpose of this paper is to compare how Slovak companies responded to market opportunities and threats in the pre- and post-COVID-19 years and to analyze how differences in internal organizational environments—conceptualized through the lens of strategic agility and dynamic capabilities—shape these responses.

Based on the identified theoretical gaps, the study addresses the following research questions:

*RQ1: How do firms' responses to opportunities and threats differ before and during crisis conditions?*

*RQ2: To what extent are firms' responses to opportunities and threats associated with the quality and maturity of the internal environment?*

*RQ3: Do opportunity-driven and threat-driven responses reflect distinct underlying mechanisms of firm behavior?*

*RQ4: How does the context of an emerging innovator economy shape the relationship between environmental perception, internal capabilities, and innovation outcomes?*

## **2. Theoretical Framework**

### **2.1. Business Environment and Company Behavior**

One of the central topics in current literature on COVID-19 and the business environment is the coping mechanisms that businesses use. Much research has focused on businesses that survived the pandemic vs. those that did not survive and closed their businesses (Breier et al., 2021; Shafi et al., 2020; Zhang et al., 2020). While this stream of research provides important descriptive insights, it often lacks an explicit theoretical integration explaining why firms differ in their responses to the same environmental shocks. At the same time, however, the authors directly formulate recommendations on how to best survive the changes brought about by the pandemic, in particular to adopt a proactive approach and to innovate rapidly (Bailey & Breslin, 2021). Rapid adaptation

and business model innovation were seen not only as reactive responses but also as strategic choices enabling firms to capture new value under uncertain conditions (Kraus et al., 2020; Clauss et al., 2019).

Crises such as the COVID-19 pandemic can serve as catalysts for opportunity recognition, forcing firms to reassess previously overlooked market needs or inefficiencies (Wenzel et al., 2021). Based on this, new business model innovation opportunities can be identified (Clauss et al. 2019, Kraus et al. 2020).

Several studies (Bapuji et al. 2020; Sooreea & Sooreea 2022) focus mainly on examining the specific impacts of the crisis on the business environment or the adjustments that companies have made. To explain these adjustments theoretically, this study draws on the strategic agility framework, which integrates environmental analysis, internal capabilities, and strategic responses under conditions of turbulence (Arbussa et al., 2017).

Asriati et al. (2022), for example, point out an important prerequisite for innovative corporate behavior and entrepreneurial success, namely creativity and the creative capabilities of employees. Within a strategic agility perspective, creativity represents one of several internal capabilities enabling firms to interpret and respond to environmental change. This means that, in line with the principles of analysis in strategic management (Ansoff, 1980), it is a very important skill for businesses to identify trends in the environment, analyze them, and then be able to react to them (Jones & Barnir 2019; Kuckertz et al. 2017). In this context, creativity becomes not only a source of innovation, but a mechanism of strategic adaptability.

Recent research highlights that strategy formulation during crises must consider volatile and complex environments, where predictability is low and adaptability is paramount (Ritter & Pedersen, 2020; Amankwah-Amoah et al., 2021).

A business therefore needs to perceive changes in the environment constantly and respond to them quickly and flexibly because the environment can change rapidly.

Recent systematic and integrative reviews indicate that research on organizational agility is theoretically fragmented and characterized by inconsistent conceptual boundaries, which limits cumulative knowledge development and cross-study comparability (Nguyen et al., 2024; Walter, 2021). Although agility is frequently linked to firm adaptability and performance, much of the literature focuses on domain-specific applications — such as digital transformation or supply chain flexibility — rather than explaining how internal organizational conditions systematically translate into strategic responsiveness (Walter, 2021; Troise et al., 2022).

Parallel debates within the dynamic capabilities literature emphasize that while the framework provides a powerful explanation of adaptation under turbulence, empirical research often struggles to operationalize internal capability structures in observable organizational terms (Eisenhardt & Martin, 2000; Schilke et al., 2018). Scholars therefore call for studies that connect abstract capability constructs with measurable organizational environments and behavioral responses (Schilke et al., 2018).

Integrating strategic agility with dynamic capabilities enables a more concrete explanation of how firms enact adaptation, linking intangible internal environments with observable responses to opportunities and threats. This integration responds directly to calls for theoretically grounded, empirically testable models of organizational responsiveness under crisis conditions (Walter, 2021; Troise et al., 2022).

To address these issues, the present study builds on dynamic capabilities and strategic agility as complementary theoretical perspectives that link internal organizational conditions (such as knowledge management, strategic alignment, and situational awareness) with observable responses to external opportunities and threats. By empirically examining these linkages in the Slovak context, this research contributes to academic debates by offering a comparative, theory-informed analysis of how intangible organisational capabilities shape adaptive strategic behaviour under crisis conditions.

## **2.2. Opportunities and Threats**

Opportunities and threats can be seen as two patterns that arise from scanning the business environment in the decision-making process in organizations (Jackson & Dutton, 1988; Ansoff, 1980). The perception of opportunities and threats is individual and based on the cognitive representations of individuals, but always refers to perceiving, scanning, and analyzing the environment.

A perceived threat for one company may be interpreted as an opportunity for another, depending on its leadership mindset, prior experience, and cognitive framing (Ekberg, 2019; Shepherd et al., 2020).

The perception of threat is most often associated with loss, deterioration of the situation, and negative impact on entities (Staw et al., 1981), whereas opportunity is perceived as an opportunity to gain, not to lose, and to improve the situation (Jackson & Dutton, 1988). An individual or enterprise may adopt a rigid attitude towards threats and opportunities, which leads to a limited response to the stimulus, remaining with their learned responses and risk aversion. Conversely, with a proactive and flexible approach, it may seize the opportunity and be more open to the risks associated with the new action (Kovoor-Misra, 2009).

From a dynamic capabilities perspective, differences in firms' responses to opportunities and threats reflect variations in their ability to sense environmental signals, seize emerging options, and reconfigure internal resources (Teece, 2007). Strategic agility research extends this view by focusing on how these capabilities become visible in organizational behavior, such as speed of decision-making, flexibility of structures, and responsiveness to external change (Arbussa et al., 2017; Duchek, 2020). In this sense, strategic agility represents the operational manifestation of dynamic capabilities in turbulent environments.

Opportunity recognition can be defined as a process where a firm seeks for a sense of indications of change and then decides whether or not to take steps to respond to that change (Grégoire et al., 2010). According to Companies and McMullen (2007), opportunities exist in the economic environment; they just need to be discovered. At the same time, opportunities can be created, e.g., through interaction with different actors and stakeholders, in creative teams, etc. Especially in times of crisis, successful opportunity exploitation relies less on rigid formal planning and more on a proactive strategic orientation, adaptive leadership, and the ability to respond through emergent strategic actions (Cammock, 2001), supported by an organizational culture that fosters change and innovation (Vargo & Seville, 2011).

The COVID-19 crisis illustrated how certain firms actively engaged in co-creating opportunities through stakeholder interaction, digitalization, and adaptation of supply chains (Crick & Crick, 2020; Davidsson et al., 2021).

In contrast, responses to threats during crisis periods often stimulate process-oriented innovations, including automation and informatization, which reflect key Industry 4.0 mechanisms (Ritter & Pedersen, 2020; Chen & Biswas, 2021).

Recent studies show that firms' ability to overcome crisis impacts depends on a set of internal and external drivers, such as access to government support, operational flexibility, resource availability, and supply chain efficiency (Moktadir et al., 2023). From a strategic agility perspective, these drivers reflect firms' capacity to sense opportunities, seize them, and reconfigure resources under conditions of turbulence.

Strategic agility is increasingly interpreted as the observable behavioural expression of dynamic capabilities, reflecting how firms translate sensing and reconfiguration processes into concrete strategic actions (Teece, 2007; Arbussa et al., 2017). Dynamic capability theory emphasizes that such responsiveness is not accidental but depends on underlying organizational structures, coordination mechanisms, and managerial processes that enable continuous environmental scanning and rapid decision-making (Helfat & Peteraf, 2014; Teece, 2018).

A closely related microfoundation of dynamic capabilities is situational awareness, understood as an organization's capacity to continuously gather, interpret, and act upon environmental information in order to maintain strategic alignment under volatile conditions (Endsley, 1995; Teece, 2018; Duchek, 2020). Within the dynamic capabilities framework, situational awareness supports the sensing function by enabling firms to recognize emerging opportunities and threats before they fully materialize.

In this study, firms that are more responsive to opportunities are expected to exhibit more mature internal organizational environments that foster such awareness, coordination, and adaptive action. Accordingly, "perform better" does not refer to financial outcomes, but to the quality and development of internal intangible organizational conditions that enable effective sensing and strategic responsiveness. These arguments lead to the following hypothesis:

*H1: Businesses that are more responsive to opportunities perform better in the assessment of their internal environment than businesses that are not responsive to opportunities*

Recent empirical evidence suggests that firms with stronger pre-existing innovation capabilities and strategic responsiveness demonstrate higher adaptability and capacity to seize opportunities during turbulent periods such as the COVID-19 crisis (Rybalka, 2024).

*H2: Businesses that respond to threats or opportunities have implemented more innovations than those that have not responded to threats or opportunities.*

Shamim et al. (2025) in their research highlights the role of rapid innovation management capabilities in enhancing business model innovation and overall innovation performance under crisis conditions, supporting the positive association between responsiveness and innovation output.

In this context, a higher number of implemented innovations is interpreted as an indicator of adaptive strategic behavior rather than as a normative measure of innovation quality, reflecting firms' active reconfiguration of processes and technologies under crisis conditions.

### **3. Methodology**

#### **3.1. Research Methods**

The aim of the research is to compare the behavior of businesses across two temporally distinct survey years characterized by different external environmental conditions, with a focus on firms' responses to perceived opportunities and threats. The research contributes to strategic management theory by examining how firms' responses to external opportunities and threats relate to internal organizational conditions relevant for long-term sustainability and development.

For the purpose of statistical comparison at different survey years, research samples of more than 384, with a confidence level of 95% and a confidence interval of 5, were provided in both study groups. The sample of enterprises from the 2016 analysis consisted of 489 Slovak enterprises; the 2021 sample consisted of 573 enterprises. Thus, the sample sizes in both survey years exceed the minimum threshold required for statistical analysis and allow for meaningful comparative examination of the surveyed populations. The research sample in both survey years was obtained to cover the dispersion of enterprises in Slovakia in terms of sectors (services/industry), size of enterprises (micro, small, medium, large), maturity (starting, growing, mature), as well as in terms of domestic companies and foreign subsidiaries. All categories of companies are represented in both research samples (Table 1), with a higher representation of start-ups as well as micro enterprises observed in 2016; however, differences in the structure of the samples reflect natural variation across survey years and changes in the broader business environment. In terms of industry and services, 27% of enterprises in the 2016 sample were in the 6 analyzed categories of industrial sectors, 38% were in the 5 categories of service sectors, and 24% were in the other non-researched categories of industry and service sectors. In 2021, overall, 50% of enterprises in the sample were in the services sector, and 40% of enterprises were in the industrial sectors. The remainder in both samples (10–11%) were public and third-sector organizations. Respondents in the research were managers and owners of businesses who could answer questions via an electronic questionnaire, which was distributed individually to each respondent.

The study does not follow a panel design. Due to respondent anonymity and data protection requirements, it was not possible to identify or track the same enterprises across both research survey years. Consequently, the samples collected in 2016 and 2021 consist of independent groups of firms, and the results do not allow for causal inference regarding the impact of the COVID-19 pandemic.

Data were collected using a structured online questionnaire administered via the eManager platform. The questionnaire was distributed electronically via email to potential respondents. Respondents were managers or HR professionals, who were considered sufficiently knowledgeable about their organizations' strategic decision-making, internal processes, and responses to external environmental changes. Participation in the survey was voluntary and anonymous, which helped to reduce potential response bias. The questionnaire was originally

developed in Slovak and subsequently translated into English for publication purposes. The English version of the questionnaire is provided in Appendix A.

Sample categorizations	2016	2021
micro	45.60%	21.47%
small	23.31%	31.59%
medium	15.34%	23.73%
large	15.75%	23.21%
domestic	81.39%	73.12%
subsidiary	16.77%	20.07%
other	1.84%	6.81%
starting	14.11%	2.44%
growing	28.63%	17.98%
mature	57.26%	79.58%
<b>ALL</b>	<b>489</b>	<b>573</b>

*Table 1. Research sample categorization*

### 3.2. Research Structure

For the purpose of the research, selected external environmental influences were analyzed and classified as opportunities or threats. Respondents were asked in one question which of the external changes they implement appropriate measures for and which of the given factors they respond to with internal changes. Consistent with crisis management and resilience research, firms' ability to respond is operationalized as observable managerial behavior, reflected in the implementation of organizational measures in response to perceived external changes, rather than as a latent or self-reported capability (Duchek, 2020). It was in the context of this question that the sensitivity of enterprises to threats and opportunities was examined, and then the results were compared over the 2 survey years studied. The examined factors were identified in the framework of research and pre-research in the APVV project, "Transforming the paradigm of management of organizations in the context of Industry 4.0." The classification of external factors into opportunities and threats follows the strategic management tradition of environmental scanning, where changes are interpreted based on their potential positive or negative impact on organizational goals and performance (Ansoff, 1980; Jackson & Dutton, 1988).

Opportunities:

- O1 - opportunity for new orders, customers, markets
- O2 - development and prosperity of business partners
- O3 - improvement of business environment and markets
- O4 - listed new European/government grants or support schemes
- O5 - decline in input prices (materials, services, labor prices)
- O6 - availability of new technologies (technological progress) for production

Threats:

- T1 - decline in orders, loss of customers
- T2 - threats from competitors (existing, new)
- T3 - risks and problems on the part of suppliers (financial, quality)
- T4 - deteriorated situation on customer and consumer markets
- T5 - new legislative restrictions (obligations) or an increase in the tax and levy burden
- T6 - deterioration of access to capital for business financing
- T7 - increase in input prices (materials, services, labor prices)
- T8 - stricter ecological and environmental restrictions and standards

The selection and grouping of opportunity and threat factors reflect key dimensions of the external business environment relevant during periods of economic disruption, including market demand, supply chain conditions, regulatory frameworks, technological change, and cost structures (Ansoff, 1980; Ritter & Pedersen, 2020).

The resulting differences were analyzed at the level of control variables (categorization of the samples) through correlation analysis at the level of the individual examined components of the enterprises. At the same time, the results were analyzed in the context of the evaluation of the factors of the internal environment of companies, namely in the 7 evaluated:

- Internal system of education, knowledge management and development
- Level of external partnerships in education and knowledge acquisition
- Level of operational coordination - organization of projects, processes and tasks
- Level of strategic alignment of development plans with existing resources
- Availability of technologies and knowledge for the development of new products/services
- Corporate culture in relation to the support of innovativeness and knowledge development
- The ability to identify and analyze trends, the ability to respond to them

Strategic management and organizational resilience literature emphasizes that the quality and maturity of the internal environment become particularly critical under conditions of environmental turbulence and crisis, as they enable faster sense-making, coordinated action, and adaptive strategic responses (Duchek, 2020; Teece et al. 2016).

Respondents evaluated their organization in terms of quality, maturity, and activity in selected areas on a five-point scale, where 1 represented an unsatisfactory level and low quality, and 5 represented a satisfactory and high-quality level. These factors were analyzed using regression analysis in relation to firms' responsiveness to opportunities and threats. Prior to model estimation, the standard assumptions of linear regression were verified, including linearity, normality of residuals, homoscedasticity, and absence of multicollinearity. The diagnostics indicated that the data met the required conditions for linear regression analysis.

Although confirmatory factor analysis (CFA) was used to validate the measurement model, the relationships between constructs were tested using regression analysis rather than full structural equation modeling (SEM). Therefore, the normality assumption primarily concerns the distribution of regression residuals. Additionally, the distributional properties of Likert-scale variables were examined, with skewness ranging from  $-0.57$  to  $0.13$  and kurtosis from  $-1.09$  to  $-0.63$ , indicating no serious deviations from normality. One variable was binary (0/1), for which normality is not assumed.

To assess the potential impact of common method bias (CMB) arising from the single-source, self-reported survey design, formal statistical checks were conducted. A  $24 \times 24$  correlation matrix was examined across all constructs, with the maximum observed correlation being  $0.64$ , below the commonly cited threshold of  $0.80$ , suggesting no excessive shared variance. Additionally, variance inflation factors (VIFs) were calculated for all constructs, yielding values ranging from  $1.13$  to  $1.83$ , substantially below the critical cutoff of  $3.3$ . These results indicate that CMB is negligible in the dataset. Consequently, the empirical analyses reported in this study are unlikely to be affected by method bias.

Factors selected for assessing the importance of internal environment were tested with confirmatory factor analysis (Table 2). Cronbach alpha scores followed the threshold  $0.7$ , as acceptable levels. Composite reliability levels were also acceptable with values greater than  $0.7$  and AVE was greater than  $0.5$  (Hair, 2017). In both selected survey years, the research construct for assessing internal environment was confirmed and acceptable.

The research compares firm responses to external environments across the two examined survey years and analyzes variations in organizational behavior under differing contextual conditions. However, it further investigates the context of strategic management theory's approaches to responding to external environments (opportunities and threats) as important factors for the long-term development and sustainability of organizations. In order to compare the significance of the differences found, the non-parametric Chi square test, suitable for qualitative data analysis, was used with the significance level set at  $p 0.05$ .

Construct	Item	Factor loading	Cronbach Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
<b>2021 Internal environment</b>	F1	0.786	0.896	0.919	0.619
	F2	0.691			
	F3	0.793			
	F4	0.787			
	F5	0.806			
	F6	0.829			
	F7	0.809			
<b>2016 Internal environment</b>	F1	0.746	0.87	0.9	0.563
	F2	0.698			
	F3	0.763			
	F4	0.785			
	F5	0.728			
	F6	0.799			
	F7	0.728			

Table 2. *Confirmatory factor analysis for internal environment assessment*

The results of the research are presented in three coherent and logical sections. The first section examines and compares in detail the companies' approach to opportunities in the 2016 and 2021 reporting survey years and evaluates them in the context of the internal environmental factors examined. The second section examines and compares in detail the businesses' approach to threats in the survey years under review, also in the context of the internal environmental factors examined. The third section synthesizes the views on opportunities and threats and analyzes the behavior of enterprises in the context of their sensitivity to changes in the external environment (negative or positive). In this section, the internal environment of enterprises was evaluated as well, together with the types of innovation activities implemented (having a positive impact on the response to the external environment).

The study employs a comparative cross-sectional design using two independent samples collected in 2016 and 2021. Although this approach allows for identifying systematic differences in firms' responses to opportunities and threats across time, it does not track changes at the firm level. Therefore, the results are interpreted as population-level differences rather than causal firm-level effects.

### 3.3. Limitations

Several limitations of the study should be acknowledged. First, the use of two independent cross-sectional samples restricts the ability to draw causal conclusions regarding the effects of the COVID-19 pandemic. Observed differences between the 2016 and 2021 samples should therefore be interpreted as contextual associations rather than direct effects.

Second, the study relies on self-reported managerial perceptions, which may be subject to subjective bias. Nevertheless, perceptual measures are widely accepted in strategic management research, particularly when examining strategic decision-making and organizational responses under conditions of uncertainty.

## 4. Results

We base this comparative study on a comparison of data for 2016 and 2021, where 2016 represents a favorable economic environment and boom in Central Europe, while 2021 represents a crisis period affected by recession, the effects of the COVID-19 pandemic and geopolitical events. Our research focused on comparing how companies approach responding to threats and opportunities in the environment provide a starting point for the development of strategies, goals, project objectives and innovations within a strategic approach to managing organizations. As shown in Figure 1, enterprises in 2021 have reduced their responsiveness mainly to opportunities but also threats from customers (gain and loss), on the contrary they

have significantly increased their responsiveness to listed new European/government grants and support schemes as well as stricter ecological and environmental restrictions. In this context, both increases can be attributed to significant changes in European and also national strategies in line with the Agenda 2030 and the related opportunities for obtaining external project funding. In the frame of the analysis, we have discussed in more detail the 6 most significant opportunities that can be applied across all sectors and the 8 most significant threats applicable to all sectors.

	T1	O1	T2	O2	T3	T4	T5	O3	O4	T6	O5	T7	O6	T8
2021	68%	65%	33%	25%	33%	31%	47%	21%	24%	13%	14%	49%	35%	35%
2016	76%	74%	37%	21%	35%	35%	44%	18%	11%	12%	14%	46%	31%	21%
Change	-8%	-9%	-4%	4%	-2%	-5%	4%	3%	13%	1%	-1%	3%	4%	15%

Table 3. Percentual comparison of companies responding to selected threats and opportunities in 2016 and 2021

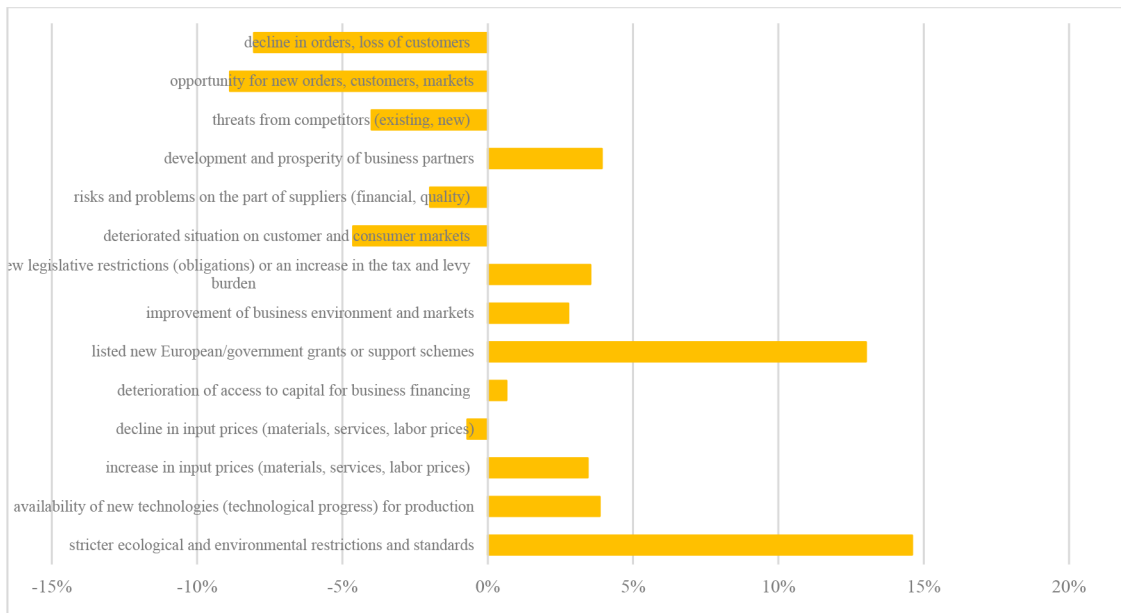


Figure 1. Deviation in reaction to opportunities and threats, 2021 vs. 2016

#### 4.1. Reaction to Opportunities

In the first section, we took a closer look at the specifics of how businesses respond to opportunities from the environment. Overall, businesses were most likely to cumulatively respond to fewer opportunities in both reporting survey years (Figure 2), with 66% of businesses responding to 1-2 opportunities in 2016 and 58% of businesses responding to 1-2 opportunities in 2021. There is a slight increase in the number of opportunities that businesses respond to in the 2021 reporting period. In the statistical validation, the results of the non-parametric Chi square test  $\chi^2 = 10.63$ ,  $p$  value=0.1, showed that at the significance level of  $p=0.05$ , this difference between the survey years is not significant.

However, a deeper analysis based on the sample categorizations found significant dependencies (Table 4). Through the correlation coefficient, we further investigated the relationships between the response to each opportunity and the size, sector, country of origin and maturity of the company. In 2016, a statistically significant relationship was found at the weak correlation level for company size, sector and maturity. For 2021, a relationship was found in size and maturity of the company but only for the opportunity: listed new European/government grants and support schemes. Larger and more mature companies respond more significantly to this opportunity.

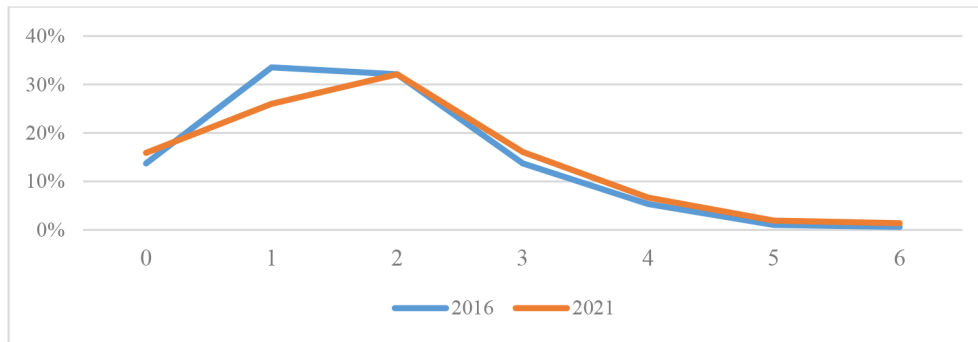


Figure 2. Year-to-year comparison of number of opportunities companies responded to

	2021	size	sector	country of origin	maturity
opportunity for new orders, customers, markets	-0.03	0.06	0.14*	-0.06	
development and prosperity of business partners	0.00	0.05	0.01	-0.01	
improvement of business environment and markets	-0.02	0.03	-0.05	0.01	
listed new European/government grants or support schemes	0.19*	-0.07	-0.09	0.10*	
decline in input prices (materials, services, labor prices)	0.04	-0.04	0.03	0.02	
availability of new technologies (technological progress) for production	0.08	-0.05	0.07	0.07	
	2016	size	sector	country of origin	maturity
opportunity for new orders, customers, markets	-0.06	0.06	-0.01	-0.09	
development and prosperity of business partners	-	0.03	-0.02	-0.09	
improvement of business environment and markets	0.10*	-0.05	0.14*	-0.06	-0.12*
listed new European/government grants or support schemes	0.15*	-	0.23*	-0.01	0.06
decline in input prices (materials, services, labor prices)	0.08	-0.06	-0.01	0.02	
availability of new technologies (technological progress) for production	0.15*	-0.01	0.08	0.05	

Note(s): \* Significant weak correlation

Table 4. Correlation analysis for opportunities and company characteristics (2021, 2016)

The following Table 5 show the exact percentages based on the categorization of the sample on occasions where significant statistical dependencies were found. In the year-on-year comparison, an increase in the response of medium and large enterprises to European grants as well as to the development and prosperity of business partners (increase in small, medium and large) can be observed. For the availability of new technologies, no significant year-on-year change is observed, with the response of enterprises to this opportunity increasing with increasing enterprise size in both observation survey years. In the case of sectoral comparison, we observe in 2021 an increase in the response of industrial sectors to the improvement of business environment and markets by 9%, and an increase in service sectors in listed European grant/government support schemes by 11%. In both cases, this is a catching up of sectoral differences, which may be a consequence of the Industry 4.0 effect on companies, which has a significant technological impact on both the service and industrial sectors, so these opportunities are equally significant for both groups studied. In terms of the maturity of the company we observe a positive increase in mature companies that react to improvement of business environment from 14% in 2016 to 21% in 2021. However, we still assess this level as insufficiently high; on the contrary, there has been an even more pronounced decline in start-ups, but this may be a consequence of the cost implications of managing a start-up under the impact of the recession. In the case of listed new European/government grants, we observe a positive increase in the response of mainly growing and mature businesses.

listed new European/government grants or support schemes	2021	2016	change
micro	13%	3%	10%
small	16%	20%	-4%
medium	40%	21%	19%
large	30%	12%	18%
development and prosperity of business partners	2021	2016	
micro	19%	25%	-6%
small	31%	20%	11%
medium	24%	19%	5%
large	23%	13%	10%
availability of new technologies (technological progress) for production	2021	2016	
micro	29%	23%	6%
small	33%	35%	-2%
medium	38%	39%	-1%
large	39%	40%	-1%
<i>improvement of business environment and markets</i>	2021	2016	change
industry	21%	11%	9%
services	23%	22%	2%
<i>listed new European/government grants or support schemes</i>	2021	2016	
industry	23%	22%	1%
services	18%	6%	11%
<i>improvement of business environment and markets</i>	2021	2016	change
starting	14%	25%	-11%
growing	22%	23%	-1%
mature	<b>21%</b>	<b>14%</b>	7%
listed new European/government grants or support schemes	2021	2016	
starting	7%	6%	1%
growing	18%	11%	7%
mature	26%	13%	13%

Table 5. Selected significant differences in reaction to opportunities presented with year-to-year change

The importance of the analysis of firms' response to opportunities points to the different behavior of firms based on their size, sector and maturity, but it also has important links to the internal corporate environment and processes, the consequences of which are precisely the proactive or reactive orientation of firms. In relation to the internal environment and the level of quality and maturity of its individual areas, we further investigated the significance of the relationships of factors such as Internal system of education, knowledge management and development, Level of external partnerships in education and knowledge acquisition, Level of operational coordination - organization of projects, processes and tasks, Level of strategic alignment of development plans with existing resources, Availability of technologies and knowledge for the development of new products/services, Corporate culture in relation to the support of innovativeness and knowledge development, The ability to identify and analyze trends, the ability to respond to them and the explored opportunities that are important for the enterprise.

The correlation analysis (Table 6) showed the significance of the quality of these factors in relation to O1 opportunity for new orders, customers, markets, O2 development and prosperity of business partners, O3 improvement of business environment and markets and O4 availability of new technologies (technological progress) for production. A significant relationship of the quality of the internal environment was not found for listed new European grant/government schemes and decrease in input prices. The highest positive relationship (0.2 to 0.21) was found for response to new contract opportunities in relation to strategic alignment, availability of technologies and knowledge and ability to identify, analyze trends and respond to them.

	O1	O2	O3	O4	O5	O6
Internal system of education, knowledge management and development	0.15	0.13	0.09	-0.03	-0.04	0.14
Level of external partnerships in education and knowledge acquisition	0.08	0.12	0.13	0.01	-0.03	0.11
Level of operational coordination - organization of projects, processes and tasks	0.17	0.14	0.11	0.01	-0.02	0.10
Level of strategic alignment of development plans with existing resources	0.20	0.15	0.10	0.01	-0.01	0.15
Availability of technologies and knowledge for the development of new products/services	0.20	0.11	0.05	-0.05	0.00	0.19
Corporate culture in relation to the support of innovativeness and knowledge development	0.17	0.02	0.08	-0.02	-0.02	0.16
The ability to identify and analyze trends, the ability to respond to them	0.21	0.10	0.12	-0.02	-0.02	0.14

Table 6. Correlation analysis for opportunities and quality of internal environment (selected factors)

In addition to the above, we used linear regression to test the significance of internal factors in influencing the number of opportunities to which firms respond (Table 7). Firm size, sector, maturity and country of origin were used as control variables in the model. The level of strategic fit at the significance level of  $p=0.03$  and beta coefficient 0.17 as well as the ability to analyze and respond to trends ( $p=0.04$ ,  $Beta=0.17$ ) proved to be significant moderating factors in number of opportunities that companies react to. As the level of these factors increases, the number of opportunities that companies react to increases, with size and sector as control variables, that was as well presented in previous detailed analysis presenting percentage differences in their behavior.

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	11.00	73.53	6.68	4.20	0.00
Residual	561.00	893.71	1.59		
Total	572.00	967.24			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	2.12	0.41	5.20	0.00**
Size	0.13	0.05	2.35	<b>0.02*</b>
Sector	0.17	0.08	2.21	<b>0.03*</b>
Country of origin	-0.16	0.09	-1.73	0.08
Maturity	0.07	0.12	0.63	0.53
Internal system of education, knowledge management and development	-0.01	0.08	0.07	0.94
Level of external partnerships in education and knowledge acquisition	0.05	0.07	-0.74	0.46
Level of operational coordination - organization of projects, processes and tasks	0.04	0.08	-0.55	0.58
Level of strategic alignment of development plans with existing resources	0.17	0.08	-2.13	<b>0.03*</b>
Availability of technologies and knowledge for the development of new products/services	0.01	0.08	-0.11	0.91
Corporate culture in relation to the support of innovativeness and knowledge development	-0.09	0.08	1.05	0.30
The ability to identify and analyze trends, the ability to react to them	0.17	0.09	-2.02	<b>0.04*</b>

Table 7. Regression analysis

#### 4.2. Reaction to Threats

In the second section of the research, based on the proposed model, we analyzed the external threats to which the firms in the sample respond. There was a year-on-year shift in the number of threats businesses responded to in the study period (Figure 3), with businesses in the 2021 period responding significantly more to threats than in 2016,  $\chi^2 = 16.99$ ,  $p$  value = 0.03. In both groups studied, the highest percentage of businesses responded to 1-4 environmental threats (15%-24%). The increase was most significant for stricter ecological and environmental restrictions and standards (21% of companies in 2016 and 35% of companies in 2021). However, the response to threats varied significantly depending on the categorization of the business.

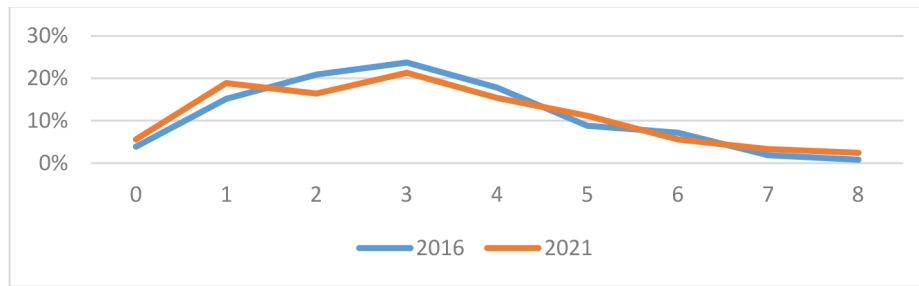


Figure 3. Year-to-year comparison of number of threats companies responded to

The most significant observable relationship was for response to stricter ecological and environmental restrictions and standards, with a positive correlation with firm size (0.21 and 0.15) and a more significant impact on the industrial sector (44% of industrial firms) in both the 2021 and 2016 survey years (Table 8). The industry sector is also correlated with the response to increase in input prices in both survey years (64% of enterprises in 2021 and 52% of enterprises in 2016, Table 9) and in 2021 also to risks and problems on the part of suppliers (44%). This result is clearly based on the effects of the current recession and problems in the supply chains of manufacturing enterprises, especially with respect to the constraints caused by the pandemic and the constraints resulting from international conflicts. The deterioration of access to capital for business financing was considered the lowest threat by enterprises in both survey years under review. However, this threat appears to be particularly significant for domestic enterprises (Table 10), where they react to the threat significantly more (15%) than foreign subsidiaries (5%),  $\chi^2 = 8.01$ ,  $p$  value=0.00. In terms of maturity level of firms, we observe significantly higher responses to threats for mature firms compared to less mature ones (growing, starting) (Table 11). However, a significant difference between the observed survey years is that start-ups and growing firms reduced their reaction to risks and problems on the part of suppliers (financial, quality). Start-ups reacted 22% less in the year-on-year shift and growing enterprises 12% less. On the contrary, the year-on-year increase is particularly observable for mature companies in stricter ecological norms and new legislative restrictions.

2021	Size	Sector	Country of origin	Maturity
Decline in orders, loss of customers	-0.09	0.06	0.05	0.01
Threats from competitors (existing, new)	-0.01	0.05	-0.01	0.05
Risks and problems on the part of suppliers (financial, quality)	0.03	-0.14*	0.03	0.07
Deteriorated situation on customer and consumer markets	0.07	-0.05	-0.01	0.03
New legislative restrictions (obligations) or an increase in the tax and levy burden	0.09	0.00	0.04	0.15*
Deterioration of access to capital for business financing	0.02	0.04	-0.12**	-0.02
Increase in input prices (materials, services, labor prices)	0.01	-0.18*	0.03	0.10*
Stricter ecological and environmental restrictions and standards	0.21*	-0.18*	0.08	0.15*
2016	Size	Sector	Country of origin	Maturity
Decline in orders, loss of customers	0.07	-0.04	0.04	0.11*
Threats from competitors (existing, new)	-0.02	0.11*	0.01	0.04
Risks and problems on the part of suppliers (financial, quality)	-0.07	-0.05	-0.03	-0.10*
Deteriorated situation on customer and consumer markets	0.07	0.05	0.05	0.05
New legislative restrictions (obligations) or an increase in the tax and levy burden	-0.11*	0.17*	-0.05	-0.05
Deterioration of access to capital for business financing	0.15*	0.02	-0.01	0.06
Increase in input prices (materials, services, labor prices)	0.08	-0.13*	-0.01	0.02
Stricter ecological and environmental restrictions and standards	0.15*	-0.23*	0.08	0.05

Note(s): \* Significant weak correlation

Table 8. Correlation analysis for threats and company characteristics (2021, 2016)

Threats	2021			2016		
	Industry	Services	Diff.	Industry	Services	Diff.
Threats from competitors (existing, new)	33%	38%	5%	30%	42%	12%
Risks and problems on the part of suppliers (financial, quality)	44%	31%	13%	41%	36%	5%
New legislative restrictions (obligations) or an increase in the tax and levy burden	46%	47%	1%	33%	51%	18%
Deterioration of access to capital for business financing	10%	13%	3%	11%	13%	2%
Increase in input prices (materials, services, labor prices)	64%	45%	19%	52%	39%	13%
Stricter ecological and environmental restrictions and standards	44%	27%	17%	31%	12%	19%

Table 9. Selected significant differences in reaction to threats based on sector

	Deterioration of access to capital for business financing
Domestic	15%
Foreign subsidiary	5%
Chi square statistics	8.01**

Table 10. Chi square test results for comparison of domestic companies and foreign subsidiaries

Threats	2021			2016		
	Starting	Growing	Mature	Starting	Growing	Mature
Decline in orders, loss of customers	50%	73%	68%	64%	77%	79%
Risks and problems on the part of suppliers (financial, quality)	21%	27%	35%	43%	39%	31%
New legislative restrictions (obligations) or an increase in the tax and levy burden	36%	31%	51%	43%	50%	41%
Increase in input prices (materials, services, labor prices)	36%	40%	52%	48%	42%	47%
Stricter ecological and environmental restrictions and standards	14%	23%	39%	12%	16%	25%

Table 11. Selected significant differences in reaction to threats based on maturity

In contrast to the results of the analysis of opportunities in the context of the internal environment of the company, its quality and maturity, no significant dependencies were found for threats, except for one (Table 12). The correlation analysis showed that enterprises that have a lower level of strategic alignment of development plans with existing resources more often react to deterioration of access to capital for business financing (correlation coefficient -0.13).

As with the analysis of response to opportunities, the significance of internal factors in influencing the number of threats to which businesses respond was tested (Table 13). Firm size, sector, maturity and country of origin were used as control variables in the model. Only firm characteristics namely firm size, sector and maturity were found to be significant moderating factors. None of the characteristics of the internal environment were found to be significant in helping enterprises decide the number of threats they respond to.

In the third section of the research the differences between companies that respond to a high number of opportunities or threats and those that respond to a low number of opportunities and threats were analyzed. The comparative analysis shows both the percentage comparison of companies in each of the studied categories - O-high (responds to a high number of opportunities) to T-low (responds to a low number of threats), while the results were more closely compared in the context of the quality and maturity of the internal environment of the company, which was assessed at the level of very good, medium or

insufficient (assessments 5-4, 3, 2-1). From Figure 4, it can be observed that the highest percentage of companies in the study sample in the period 2021 respond to a low number of opportunities (74%) and a low number of threats (62%), while only 10% of companies in the sample responded to a high number of opportunities.

	T1	T2	T3	T4	T5	T6	T7	T8
Internal system of education, knowledge management and development	-0.02	-0.08	-0.04	-0.06	-0.01	-0.09	-0.02	0.04
Level of external partnerships in education and knowledge acquisition	-0.10	-0.07	-0.02	-0.06	0.03	-0.06	-0.04	0.05
Level of operational coordination - organization of projects, processes and tasks	-0.06	-0.01	0.01	-0.02	0.07	-0.03	-0.05	0.05
Level of strategic alignment of development plans with existing resources	-0.08	0.03	0.02	-0.05	0.01	<b>-0.13*</b>	-0.01	0.04
Availability of technologies and knowledge for the development of new products/services	0.02	0.00	-0.03	-0.02	-0.05	-0.06	-0.03	0.01
Corporate culture in relation to the support of innovativeness and knowledge development	-0.02	0.00	-0.05	-0.05	-0.01	-0.04	-0.04	-0.01
The ability to identify and analyze trends, the ability to react to them	-0.03	0.00	-0.08	-0.02	-0.05	-0.04	-0.01	0.00

Table 12. Correlation analysis for threats and quality of internal environment (selected factors)

ANOVA	df	SS	MS	F	Significance F
Regression	11.00	117.21	10.66	3.02	0.00
Residual	561.00	1978.07	3.53		
Total	572.00	2095.28			
	Coefficients	Standard Error	t Stat	P-value	
Intercept	0.41	0.60	0.68	0.50	
Size	0.20	0.08	2.45	0.01**	
Sector	0.38	0.12	3.34	0.00**	
Country of origin	-0.23	0.14	-1.72	0.09	
Maturity	0.56	0.17	3.21	0.00**	
Internal system of education, knowledge management and development	0.14	0.11	-1.24	0.22	
Level of external partnerships in education and knowledge acquisition	0.08	0.10	-0.77	0.44	
Level of operational coordination - organization of projects, processes and tasks	-0.14	0.12	1.24	0.22	
Level of strategic alignment of development plans with existing resources	0.01	0.12	-0.10	0.92	
Availability of technologies and knowledge for the development of new products/services	0.05	0.12	-0.41	0.68	
Corporate culture in relation to the support of innovativeness and knowledge development	-0.02	0.12	0.14	0.89	
The ability to identify and analyze trends, the ability to react to them	0.06	0.13	-0.44	0.66	

Note(s): \*\*significance level at  $p < 0.01$

Table 13. Regression analysis for number of threats companies respond to

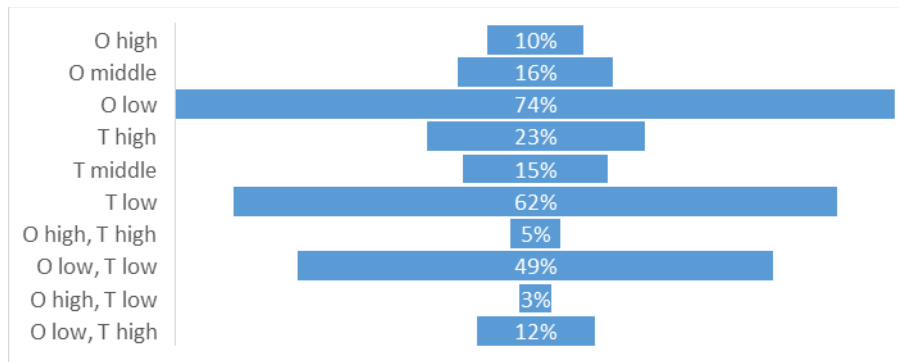


Figure 4. Percentual comparison of companies reacting to high, middle or low number of O and T

When analyzing companies that react primarily to opportunities and little to threats, compared to those that react primarily to threats and little to opportunities, we see significant differences in the assessment of the internal environment of the company (Table 14). The most significant difference can be observed in the assessment of the ability to identify, analyze and respond to trends (89% very good in group 1 vs. 55% very good in group 2) and also in the availability of knowledge and technology for the development of new services/products. All characteristics of the internal environment were found statistically significant at the  $p < 0.01$  level, except for the internal system of education and external partnerships for education and knowledge acquisition.

	O high, t low			O low, t high			Chi square test
	Very good	Medium	Insufficient	Very good	Medium	Insufficient	
Internal system of education, knowledge management and development	56%	33%	17%	49%	26%	26%	8.69
Level of external partnerships in education and knowledge acquisition	72%	11%	22%	41%	30%	30%	5.64
Level of operational coordination - organization of projects, processes and tasks	72%	28%	6%	58%	28%	16%	19.03**
Level of strategic alignment of development plans with existing resources	78%	11%	17%	59%	26%	16%	24.59**
Availability of technologies and knowledge for the development of new products/services	89%	6%	11%	58%	30%	13%	26.07**
Corporate culture in relation to the support of innovativeness and knowledge development	72%	17%	17%	59%	26%	16%	24.05**
The ability to identify and analyze trends, the ability to react to them	89%	6%	11%	55%	32%	14%	34.71**

Note(s): \*\*significance level at  $p < 0.01$

Table 14. Statistical comparison of companies reacting primarily to opportunities and primarily to threats in context of quality of internal environment

In relation to the analysis of hypothesis 2, we equally tested the difference between businesses that are more sensitive to the external environment overall in terms of both threats and opportunities vs. businesses that are less sensitive to changes in the external environment (Table 15). Again, it can be observed that enterprises that are overall more sensitive to the external environment reported higher quality and maturity of the internal

environment in the self-assessment, with a statistically significant difference found in the ability to identify, analyze and respond to trends,  $\chi^2 = 10.32$ ,  $p$  value = 0.04.

	O high, t high			O low, t low			Chi square test
	Very good	Medium	Insufficient	Very good	Medium	Insufficient	
Internal system of education, knowledge management and development	67%	17%	20%	50%	31%	20%	4.51
Level of external partnerships in education and knowledge acquisition	73%	23%	7%	48%	31%	22%	7.67
Level of operational coordination - organization of projects, processes and tasks	77%	13%	13%	60%	27%	14%	3.6
Level of strategic alignment of development plans with existing resources	67%	23%	13%	58%	28%	15%	3.1
Availability of technologies and knowledge for the development of new products/services	73%	13%	17%	61%	25%	14%	5.84
Corporate culture in relation to the support of innovativeness and knowledge development	73%	13%	17%	62%	25%	13%	3.12
The ability to identify and analyze trends, the ability to react to them	77%	13%	13%	65%	24%	11%	10.32*

Note(s): \*significance level at  $p < 0.05$

Table 15. Statistical comparison of companies with high sensitivity to external changes and low sensitivity

As a result, the ability to respond to opportunities is not only related to the quality and maturity of the company's internal environment, but also has a direct impact on the activities that the company carries out in relation to the external environment. In the period 2021, we analyzed 4 selected types of innovation introduction into the enterprise, and for all types a statistically significant difference was found between enterprises that respond to many opportunities and those that respond to few opportunities (Table 16). In the case of process innovation, this was a high difference of 27% of enterprises between the groups studied. In the case of enterprises responding to a high and low number of threats, a significant difference was found for automation and informatization. Enterprises responding to a lot of threats implemented automation (30% vs. 19%) and computerization (42% vs. 31%) in higher numbers. This result clearly shows the impacts of Industry 4.0 that are identified by firms that respond to both the opportunities and threats that Industry 4.0 brings, on the contrary, they are only introduced in small numbers in firms that do not respond to changes in the external environment.

	Process innovation	Automation	Informatization	Strengthening product development and innovation
O high	70%	30%	53%	44%
O low	42%	19%	29%	20%
<b>Chi square statistics</b>	<b>15.56**</b>	<b>3.94*</b>	<b>12.63**</b>	<b>21.45**</b>
T high	53%	30%	42%	29%
T low	47%	19%	31%	24%
<b>Chi square statistics</b>	<b>1.16</b>	<b>6.4*</b>	<b>4.8*</b>	<b>1.16</b>

Note(s): \*significance level at  $p < 0.05$ , \*\*significance level at  $p < 0.01$

Table 16. Effect of responses to threats and opportunities and innovation activity

## 5. Discussion

The results of the year-on-year comparisons showed that businesses in the recession (2021) were less responsive to both new contract opportunities and the decline in new contracts than in 2016 (−9% and −8%, respectively). Rather than indicating reduced environmental awareness, this pattern may reflect constrained strategic attention under crisis conditions, where firms prioritize short-term survival over opportunity exploration, consistent with crisis-driven managerial cognition (Ritter & Pedersen, 2020; Wenzel et al., 2020). At the same time, firms remained consistently most responsive to market changes (65%–68% in 2021), suggesting that responsiveness is selectively activated toward stimuli with immediate performance implications.

In contrast, responsiveness significantly increased in relation to new grant schemes (from 11% to 24%) and stricter ecological and environmental regulations (from 21% to 35%), indicating a shift toward institutionally induced adaptation. This suggests that, under crisis conditions, external regulatory and financial incentives may partially substitute for internally driven strategic proactiveness, which aligns with recent institutional perspectives (Aguilera et al., 2019; Jackson et al., 2020).

Firm-specific characteristics further shaped these responses. Medium and large enterprises significantly increased their responsiveness to grant schemes (+19% and +18%), as well as to the prosperity of business partners. However, responsiveness to technological opportunities remained limited, with only 35% of firms reacting on average. This is consistent with the position of Slovakia as an emerging innovator (European Commission, 2022), where structural constraints, capability gaps, and uncertainty limit the adoption of advanced technologies (Cenamor et al., 2017; Verhoef et al., 2021). In line with this, suppliers integrated into global value chains tend to adopt already tested technologies from parent companies, reflecting a dependent innovation pattern (Gereffi et al., 2005).

In terms of business maturity, mature firms increased their responsiveness to improvements in the business environment (from 14% to 21%), and both growing and mature firms increased their responsiveness to grant schemes. Nevertheless, these opportunities were utilized by less than 25% of firms in the sample. Compared to innovation leader countries, such as the DACH region, where responsiveness to improvements in the business environment reached 41% already in 2016 (Kohnová, 2016), this indicates persistent differences in strategic proactiveness across innovation systems.

The sensitivity of start-ups and growing enterprises to supplier-related risks decreased during the recession, which is consistent with research on crisis adaptation and supply chain resilience (Bartik et al., 2020). Their inherent flexibility and prior supply chain optimization likely mitigated perceived vulnerability, supporting arguments that investments in resilience reduce exposure to shocks (Ivanov & Dolgui, 2020).

Sectoral differences narrowed over time in responsiveness to market opportunities and grant schemes, supporting the view that Industry 4.0 affects all sectors (Frank et al., 2019; Verhoef et al., 2021). However, industrial firms remained more sensitive to input price changes and environmental regulation, while service firms were more responsive to competitive pressures.

Importantly, the results confirm H1: the quality and maturity of the internal environment—particularly the ability to identify, analyze, and respond to trends and strategic alignment—positively influence responsiveness to opportunities. This supports recent extensions of the dynamic capabilities framework emphasizing microfoundations (Teece, 2018; Felin et al., 2015).

However, the most theoretically significant finding relates to the implicit assumption of symmetry. Responsiveness to threats was not strongly dependent on internal maturity, yet it still led to increased innovation, particularly in automation and informatization, statistically confirming H2. This finding challenges the dominant assumption that internal capabilities uniformly drive responses to both opportunities and threats. Instead, this pattern suggests that threat-driven responses are shaped by a necessity-driven mechanism, where external pressure and urgency, rather than internal capabilities, become the primary drivers of innovation.

The results suggest two distinct mechanisms of innovation:

- capability-driven innovation, linked to opportunity exploitation and internal alignment
- necessity-driven innovation, triggered by external pressure and less dependent on internal capabilities

This distinction contributes to the ongoing debate on crisis-driven innovation. While some studies emphasize resource constraints (Wenzel et al., 2020), others highlight acceleration effects (Clauss et al., 2020). Our findings reconcile these perspectives by showing that both dynamics coexist but are activated under different conditions.

From a theoretical perspective, these findings point to important boundary conditions of the dynamic capabilities framework. While the framework assumes intentional, capability-based adaptation, the evidence suggests that under high external pressure, firms may rely on reactive, necessity-driven adjustment that does not depend on developed internal capabilities. This implies that existing models may overestimate the role of internal capabilities in crisis contexts and should be extended to account for alternative, constraint-driven pathways of adaptation.

## 6. Conclusion

The aim of this study was to assess differences in firms' perceptions and responses to the external environment before and during the COVID-19 crisis, while examining the role of internal organizational conditions in shaping these responses. Building on the premise that environmental scanning represents a starting point for strategic decision-making (Jackson & Dutton), the study analyzed how firms translate external signals into strategic and innovation outcomes.

Beyond this objective, the study provides a combined theoretical, empirical, and contextual contribution. Theoretically, it challenges the implicit assumption in the dynamic capabilities literature that internal capabilities uniformly drive responses to opportunities and threats, demonstrating instead that these relationships are asymmetric and mechanism-dependent. Empirically, it offers comparative evidence across two time periods (2016 vs. 2021), capturing firm behavior under contrasting environmental conditions. Contextually, it extends existing knowledge by focusing on an emerging innovator economy, where structural constraints shape strategic responses.

Consistent with H1, the findings confirm that firms more responsive to opportunities exhibit higher quality and maturity of their internal environment, particularly in strategic alignment and trend analysis capabilities. This reflects a capability-driven mechanism, where internal resources enable proactive opportunity exploitation.

At the same time, the results show that responsiveness to threats—while less dependent on internal maturity—also positively influences innovation outcomes, particularly in automation and informatization, confirming H2. This effect can be explained by a necessity-driven mechanism, where firms adopt innovations in response to external pressure, urgency, and resource constraints rather than internal readiness.

This distinction between capability-driven and necessity-driven mechanisms represents the main theoretical contribution of the study, as it challenges the prevailing assumption of uniform, capability-based adaptation and introduces a mechanism-based explanation of firm responsiveness under crisis conditions. It suggests that firm responses to environmental change are not uniform but depend on the nature of the stimulus, thereby refining existing theoretical perspectives and contributing to ongoing debates on crisis-driven innovation.

From a theoretical perspective, the findings extend the dynamic capabilities and strategic agility literature by demonstrating that adaptive behavior is context-dependent. While opportunity responsiveness reflects proactive and capability-based adaptation, threat responsiveness represents reactive, constraint-driven adjustment. This highlights the need to extend existing models by incorporating multiple pathways of adaptation, including those driven by external constraints rather than internal capabilities.

From a practical perspective, the results suggest that firms should invest in internal capabilities related to environmental scanning, strategic alignment, and trend analysis to enhance opportunity exploitation. At the same time, in crisis situations, managers should focus on rapid, necessity-driven responses, particularly in automation and digitalization, to ensure operational stability. For policy makers, the findings highlight the importance of

targeted support instruments, such as grant schemes, which significantly influence firm behavior in turbulent environments.

The study is based on two independent samples of Slovak enterprises (489 in 2016 and 573 in 2021). Limitations include the cross-sectional design, differences in sample structure across years, and the specific economic conditions in 2021, which may have influenced responses. Future research should extend the analysis longitudinally and across different institutional contexts.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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### **Authors' contributions**

Nikola Salajová: formal analysis, acquisition of funds, research.

Lucia Kohnová: conceptualization, data processing.

### **Data availability**

Data available upon request

### **Use of Artificial Intelligence**

Artificial intelligence tools (ChatGPT) were used exclusively to support language editing, grammar correction, and improvement of readability of the manuscript. All scientific content, interpretation of results, conclusions, and final editorial decisions were developed and verified by the authors. No AI tools were used for data generation, statistical analysis, or result interpretation.

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## Appendix A – Questionnaire

### 1) Please indicate the size of your organization, according to the number of employees

*Please select only one answer from the options provided.*

- 0 - 9 employees - micro enterprise
- 10 - 49 employees - small enterprise
- 50 - 249 employees - medium-sized enterprise
- 250 or more employees - a large enterprise

### 2) Please indicate in which selected sector your organization operates

*Please select only one answer from the options provided.*

- automotive
- electrotechnical industry
- engineering
- construction
- woodworking industry
- agriculture
- pharmaceutical and medical industries
- information and communication technologies
- wholesale, retail
- transport, logistics and warehousing
- financial and insurance services
- accommodation and catering services
- legal, economic, business consulting
- another industry
- other services
- public sector organizations
- third sector organizations

### 3) Please indicate the type of organization

*Please select only one answer from the options provided.*

- domestic company
- foreign company
- other

### 4) At what stage is your organization?

*Please select only one answer from the options provided.*

- start-up, young company
- growing, developing company
- mature, stable company

**6) Evaluate the environment of your organization in terms of quality, maturity and activity in the following areas:**

*Rate on a scale of 1-5 (1 - complete / maximum level of security, 5 - none / insufficient fulfilment of the criterion)*

Area	1	2	3	4	5
Internal system of education, knowledge management and development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of external partnerships in education and knowledge acquisition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of operational coordination - organization of projects, processes and tasks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of strategic alignment of development plans with existing resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Availability of technologies and knowledge for the development of new products/ services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Corporate culture in relation to the promotion of innovation and knowledge development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The ability to identify and analyse trends, the ability to respond to them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**19) In which of the following changes does your organization most often take significant measures and implement significant changes (organizational, procedural, investment, cost-saving and others)?**

*From the options listed, select any changes to which you actually respond by making changes to your organization's internal environment*

- decrease in orders, loss of customers
- chances for new orders, customers, markets
- threats from competitors (existing and new)
- development and prosperity of business partners
- risks and problems on the part of suppliers (financial, quality)
- deteriorating situation in consumer and consumer markets
- new legislative restrictions (obligations) or an increase in the tax and levy burden
- improving the business environment and markets
- new European / government grants or support mechanisms
- deteriorating access to capital for corporate finance
- decline in input prices (materials, services, labor prices)
- increase in input prices (materials, services, labor prices)
- availability of new technologies (technological progress) for production
- stricter ecological and environmental restrictions and standards

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