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Use of Management Control as a Stimulus for Organizational Resilience: single-entity survey in a petroleum derivatives company

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Abstract

Purpose: The paper aims to investigated how the use of the Management Control System influences in the management of organizational resilience in a Brazilian company.
Method: A survey single entity developed in a Brazilian oil derivative trading company with structure, size and management control system required for the research. The data were collected based on a questionnaire sent to executives from different department For data analysis, the structural model was estimated using the partial least squares method (PLS-PM - Partial Least Squares Path Modeling).
Results: The results support the hypothesis that the use of the management control system has a positive impact on the strategic. Thus, it was observed that high levels of the use of the management control system in the forms of beliefs systems, boundary systems, diagnostic control system and interactive control system increase the organization's capacity for resilience by acting in a proactive way, with strategic vision facing the business context's adversities, providing the strategic renewal proposed by Simons (1995).
Contributions: The theoretical contribution lies in the development of a model that aims to assist organizations in managing organizational resilience through management control systems. The use of the priority map for data analysis brought a practical point of view, this helps managers to decide which pattern of control best fits the circumstances in which they operate and their strategic challenges, contribute to understanding how the use of management control system impacts on the resilience in the organizational environment.

Keywords: Organizational resilience; Management control system; Survey single Entity; Resilience management; Strategic resilience.

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Introduction

The business environment is constantly changing, and managing change, adapting to an uncertain future are challenges that require resilience from companies (Hamel & Välikangas, 2003). That is, companies need to develop the ability to survive, adapt, and sustain business in the face of changes. Management control systems are relevant for the continuity of organizational activities as they direct the strategies adopted by organizations (Berry et al., 2005).

Although the topic of management control has been established, non-financial elements are increasingly present in the organizational management environment. In this regard, resilience is one of the qualitative elements that has a significant impact on management, promoting a competitive advantage for organizations. It assists companies in developing risk tolerance and the ability to adjust to uncertain scenarios, positioning them better in their market (Burnard & Bhamra, 2011). A resilient organization can achieve its goals in the face of adversity, simultaneously reducing vulnerability and developing adaptive capacity. That is, the company increases its agility to effectively manage present and future problems and critical incidents. In a competitive environment, an organization aware of its strengths in resilience is better equipped to find opportunities in adverse situations. According to Starr et al. (2003), this is possible as the organization aligns its strategy with management control systems.

There was a possibility identified to conduct an academic investigation in management accounting through the theoretical model "Levers of Control" by Robert Simons (1995, 2000). The purpose is to analyze the mechanisms of the management control system used to implement and monitor the organizational strategy. The aim is to understand how managers control the strategy using the four levels of control: belief systems, boundary systems, diagnostic control systems, and interactive control systems. With the intention of promoting research in the academic sphere that is in line with the organizational activities emerging from companies regarding the management control system, this study aims to verify the existence of an association between the management control system and strategic resilience in the organization under study.

From a methodological perspective, this study contributed to the development and validation of the scale to measure Strategic Resilience with ten factors at the organizational level. It allows organizations to cultivate a resilience planning culture aimed at enhancing the company's proactive capacity rather than simply addressing daily business problems and adversities. The theoretical contribution of this research expanded studies involving management control systems under Simons' four levers of control (1995, 2000) in the national context and its correlation with organizational resilience theory. This facilitated the development of a model intended to assist organizations in managing organizational resilience through management control systems. The use of a priority map provided a practical aspect to aid managers in deciding which control patterns best suit their operational circumstances and strategic challenges. It contributes to understanding how the use of the management control system impacts resilience in the organizational environment. Furthermore, it fosters a competitive advantage within the organization, as the management control system helps the organization strategically manage resilience elements, enabling flexibility, adaptability, and recovery from daily issues.

2 Management Control System (MCS)

In the contemporary, global, competitive, and complex business environment, companies are being challenged to adopt business models that allow them to deal with uncertainties and strategic risks they face in their business environments (Acquaah, 2013). Management accounting researchers argue that one of the ways companies can continuously rejuvenate to survive and succeed in these complex and uncertain environments is to understand the role of the Management Control System (MCS) in creating competitive advantages (Simons, 2000; Widener, 2007). According to Davila et al. (2009), MCS can provide essential discipline in helping manage uncertainty and support the need for formal management control systems in uncertain settings because the forward-looking efforts typically associated with MCS complement the rapid response to new information to enhance how organizations deal with uncertainty. Simons (1995) points out that MCS is essential in aiding managers to formulate strategies, specify the operational actions needed to implement these strategies, clarify mutual expectations, identify priorities for operational improvements, and set goals that can influence current and subsequent performance.

In this research, the management control system is defined by the way managers use it to make decisions in the organizational performance management process, being trained from the point of view of Simons' (1995, 2000) four control levers that supports the purpose of business growth by generating motivation from information sharing and organizational learning. In this approach, the four levers of control (focus systems, restriction systems, diagnostic use and interactive use of the control system) are used as strategic control to assist organizational practices over time and in achieving organizational objectives.

Simons' (1995) levers of control combine a focus on strategy with a broader view of the control mechanisms that can be used to implement the strategy. The belief system is used to inspire and direct the search for new opportunities, the boundary system imposes limits on

the quest for opportunities, the diagnostic control system aims at motivation, monitoring, and providing rewards for specific objectives, and the interactive control system encourages organizational learning, from which new ideas and strategies emerge. Business strategy control is achieved through the integration of these four control levers. The power of these levers in implementing strategy lies not in how each is used individually, but in how they complement each other when used together (Simons, 2000).

Therefore, when using the management control systems proposed by Simons (1995, 2000), the goal is to develop an organizational framework that oversees, integrates the business, and monitors risks in order to enable the company to enhance decision-making in response to risk as it faces unforeseen changes in the environment, consequently fostering the organizational capacity for resilience. The management control system plays a role in adapting managerial attitudes and behaviors to be more consistent with the new strategy and the new competitive environment.

Widener's research (2007) served as the foundation for constructing the research instrument (listed in Table 3), as it was the pioneer in developing and empirically testing the data collection tool to capture the elements proposed by Simons (1995, 2000) in his theoretical model.

3 Resilience Management from a Strategic Perspective

This research was developed from the perspective of organizational resilience under the proactive approach at the organizational level, aiming to discuss strategy, management, systems, and daily issues that unfold in organizations prior to the occurrence of adversity. From this perspective, companies exhibit the following characteristics: proactivity, competitive advantage, and adaptive capacity, allowing them to anticipate and prepare for moments of adversity, particularly in recovering from daily challenges. According to Nascimento (2014), the management of strategic resilience aims to assist the organization in the decision-making process, offering attributes that managers can use to justify their improvement actions.

Management of resilience from a strategic perspective, also known as active organizational resilience or simply strategic resilience, occurs within organizations before adversity strikes and refers to the organization's deliberate effort to become more equipped to deal with future challenges. This involves identifying potential risks, developing early warning systems, and taking proactive measures. The goal is to enhance the organization's ability to manage the market and act proactively by anticipating challenges, adapting its strategies, and capitalizing on opportunities to maximize gains while minimizing issues (Nascimento, 2014; Lengnick-Hall & Beck, 2009; Lengnick-Hall et al., 2011).

Akgün and Keskin (2014) argue that these proactive measures ensure the company's growth in the face of adversity. According to Lengnick-Hall et al. (2011), within this approach, organizational resilience is linked to competitive advantage and the company's adaptive capacity to absorb complexity, allowing the organization to develop new capabilities and leverage its resources not only to address current dilemmas but also to explore new opportunities and build a successful future. Salgado (2013, p. 23) states that this aspect of organizational resilience presents the organization's ability to adapt and be flexible to changes as a way to maintain a competitive advantage, offering an inside-out approach. Among the proponents of this approach are authors such as Hamel and Välikangas (2003), Lengnick Hall and Beck (2005), and Lengnick-Hall et al. (2011).

The theoretical model comprises ten elements and forty-four assertions (listed in Table 4), based on research from Nascimento (2014); Stephenson (2010); Lee et al., 2013; Hamel and Välikangas (2003); Starr et al. (2003); Lengnick-Hall and Beck (2005, 2009); Lengnick-Hall et al. (2011); Akgün and Keskin (2014); and Weick and Sutcliffe (2007), aiming to: (i) capture the perception of opportunities for strategic resilience; (ii) identify the level of resilience in each department within the organization at the time of the research; and (iii) examine its association of strategic resilience with the management control system through structural model estimation. Strategic resilience is defined as the organization's ability to be alert, anticipate, respond, avoid, and adapt to meet market expectations by acting proactively as it perceives signals of change, adjusting its strategies to capitalize on opportunities, maximizing gains, and minimizing problems (Nascimento, 2014; Lengnick-Hall & Beck, 2009). The ten elements of strategic resilience management are detailed in Table 1.

Table 1 - Strategic Resilience Indicators

INDICATOR	DEFINITION
Strategic Vision (VE)	the organization's ability to understand the organization as a whole and the challenges of business activity, aligning organizational priorities with changes and market demands.
Proactive Posture (PP)	the organization's ability to anticipate changes in order to reduce vulnerabilities in highly complex environments.
Organizational Learning (AO)	the organization's ability to learn from mistakes and issues that have occurred, from experience and from management practices that encourage questioning reality.
Organizational Communication (CO)	the process of interaction between individuals in the organization to transmit and share information, socialize new knowledge and, through information systems, provide transmission of this to all organizational levels.
Innovation and Creativity (IC)	the organization's ability to build innovative and creative solutions to problems, processes and products.
Autonomy in Decision Making (TD)	the ability to delegate authority and power to the organization's employees, aiming for decision-making with autonomy, agility and responsibility by qualified people.
Leadership (LD)	the ability to understand the environment and respond quickly and effectively to changes in the sector, adapting ahead of competitors. Furthermore, it is leadership that promotes space for discussion in which managers listen to problems and solutions arising from different organizational levels, providing constant feedback.
Human Factor (FH)	people in the organization who perceive their work environment as conducive to taking interpersonal risks, developing effective interpersonal relationships, and establishing both individual and group responsibilities for the organization, its performance, and potential problems.
Effective Partnerships (PE)	the organization has strategic alliances when developing interpersonal relationships internally and, externally, the company has links with its stakeholders (partners) and is aware of their connection and interdependence in the development of its activities, especially in situations of adversity.
Available Resources (RD)	the organization's act of knowing the resources it needs to operate and the ability to prioritize and allocate those resources in a way that aligns them with its priorities.

Source: Developed by the authors

4 Development of the Hypothesis and Theoretical Model

Resilience comes from the need for organizations to reinvent themselves and adapt to changes, dynamically. Thus, resilience, in the view of authors Hamel and Välikangas (2003), promotes changes in organizational models and organization strategies. It is worth emphasizing that, with the high complexity of the business scenario and its interdependence, entities become more vulnerable, given the high level of threats and dangers that permeate the external environment. Whitehorn (2011) points out that there is a need for companies to control such events so that they do not turn into an emergency, crisis or catastrophe. Corroborating, Lengnick-Hall and Beck (2009) write that resilient behavior allows entities to learn more, implement new routines and better utilize their resources in conditions of uncertainty that can definitively affect the future of the organization. According to Bhamra et al. (2011), cultivating elements of resilience can be fundamental for an organization to obtain a competitive advantage, which researchers call "strategic resilience".

Acquaah et al. (2011) point out that the development of organizational resilience must come from a strategic initiative aimed at reducing vulnerabilities caused by changes in the competitive environment. Therefore, the resilient organization effectively aligns its strategy, its operations, its management systems, its governance structure, and its decision support capabilities, in order to continuously adapt to risks, which leads to a competitive advantage (Starr et al., 2003; Salgado, 2013). Furthermore, organizations need to be able and willing to adapt to sudden changes in the environment in which they operate. Corroborating, Hamel and Välikangas (2003) argue that, for entities to have continuity and be successful, they must evolve as resilient business systems, constantly adapting to reflect changes in the environment.

The configuration of organizations' systems acts as an antecedent to organizational resilience, as it directly influences it (Beuren & Santos, 2019; Beuren et al., 2020). Corroborating Frare et al. (2023) also state that management control mechanisms lead to the development of greater levels of organizational resilience. According to Anthony and Govindarajan (2008), management control systems help managers move the organization towards its strategic objectives, promoting conditions for the company to anticipate the future, ensuring that objectives are achieved. Management control systems are relevant to the continuation of organizational activities as they direct the strategies adopted by the organization (Berry et al., 2005). The role of management control systems as the generator (in management) of organizational resilience encourages institutions to develop the following attributes of organizational resilience presented by Whitehorn (2011): anticipating emerging threats and understanding their effect on the organization's objectives and strategic objectives; assume strong leadership that articulates and encourages the implementation of organizational goals and strategic objectives; stimulate and support your workforce; promote a network with strategic alliances; and develop the ability to respond and recover quickly.

According to Burnard and Bhamra (2011), through the cultivation of resilience elements in organizational systems, one can develop not only a tolerance to risk, but also an innate ability to adjust proactively in a scenario of environmental uncertainty. For the authors, organizations would not only be better positioned and prepared to deal with the demands of high-impact events, but they would also be able to seek opportunities and gains through uncertainty, that is, through the development of organizational resilience, companies would be more prepared to assume and manage risks, which would bring a better positioning in the market context.

Therefore, this research investigates how the use of Management Control Systems (MCS) helps the company to develop its resilience capacity as it begins to understand the context of its operational environment, to recognize its main vulnerabilities, to adapt itself in the dynamic, complex and interconnected environment in which it operates, and to be flexible as it adapts to such changes (McManus et al., 2007). As previously presented, the choice of the theoretical model “Levers of Control” by Robert Simons (1995, 2000) is connected to its purpose, which is to analyze which management control systems are used to implement, control and promote direction for the renewal of strategic organizational, while exercising

control so that strategic objectives are achieved (Simons, 1995).

Figure 1 below illustrates the theoretical model used and tested in this research, showcasing the proposed relationships between the management control system with its four control levers and strategic resilience. It is worth emphasizing that the theoretical design was developed based on the theoretical-empirical discussions outlined in the literature.

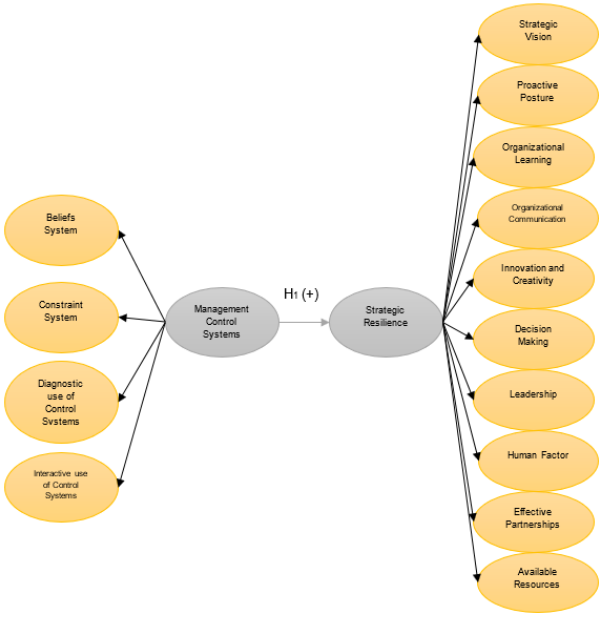


Figure 1 - Theoretical Model
Source: Developed by the authors.

Based on the arguments presented, the hypothesis of this research was formulated, thus suggesting **H_1: The use of management control systems positively impacts strategic resilience.** Furthermore, it's emphasized that the expectation of H1 is due to the investigation being carried out at the organizational level. Therefore, an organization that possesses management control systems facilitates adaptation to novelty, drives strategic changes and innovation (Davila & Foster, 2008), promoting resilience as a competitive advantage, that is, the organization's ability to adapt, be flexible, and recover from daily problems (Bhamra et al., 2011; Lengnick-Hall et al., 2011; Salgado, 2013; Nascimento, 2014; Starr et al., 2003). Supporting this, Starr et al. (2003) indicate that for a company to become resilient, it's necessary to diagnose risks and interdependencies across the entire enterprise, adapt the corporate strategy and operational model, and support increased risk and environmental complexity.

5 Methodology

A single-entity survey was conducted in a Brazilian company operating in the petroleum derivatives trade sector, possessing the structure, size, and management control system required for the investigation, and exhibiting a certain level of organizational resilience as it has been operating in the national scenario for over 60 years. The choice of the company was convenient, as during the research period, it was undergoing a crisis involving changes in its structure and mode of operation. The ongoing nature of this scenario, persisting for months, underscored the importance of the resilience theme in the organization's day-to-day reality. The study's sample was non-probabilistic, and the research did not aim to generalize the findings.

According to Mucci et al. (2016), a single-entity survey primarily uses questionnaires (often electronic) sent to a group of managers within an organization, considering multiple respondents within the same company (Van der Stede et al., 2005). Mucci et al. (2016, p. 290) emphasize that this methodology "studies phenomena in more depth, following the logic of a single organizational context," aiming to reflect not only the organization's beliefs but also the beliefs that permeate various areas. The researchers suggest that the data collection instrument should provide a research protocol outlining the research scope to the company's authorities, data collection procedures, and the research development schedule. Van der Stede et al. (2005) assert that this is not the most common methodological approach in the field of management studies. However, since the 1990s, the single-entity survey has been used by Management Accounting researchers, although it was not always referred to by this terminology. In most cases, it was described as quantitative, descriptive, cross-sectional research, involving a self-administered questionnaire in a specific industry.

This study used a path model to investigate how the use of the management control system within a specific organization in an adverse context affects strategic resilience. The structural model was estimated using the Partial Least Squares Path Modeling (PLS-PM) method, involving second-order variables (Management Control System and Strategic Resilience), control variables, and method bias assessment variables (Measured Latent Marker Variable - MLMV). Subsequently, the discussion covered the quadrants of the priority map, which serves a practical professional application to help managers identify how the indicators are being developed and which ones should receive priority in terms of investments and resources for managing Organization A in the investigated context (Mikulić et al., 2016).

The data collection took place in the second semester of 2017 using a questionnaire designed through the online Survey Monkey® platform and sent via email to executives from various areas within the organization. It's important to note that this research gathered the perceptions of managers in five different departments (Operational Department, Planning Department, Financial Department, Product A Department, and Product B Department) and in management roles reporting directly to the Board of Directors and the Presidency (Ombudsman, Audit, Compliance Management, Human Resources, Legal, and International Relations).

Van der Stede et al. (2005) emphasize the necessity for research to capture the organization's perspective by including multiple respondents from the same organizational unit. This complements the guidance presented by Anderson and Widener (2006), suggesting that, before including all types of employees in the sample, it is important to conduct unstructured interviews with top management to identify potential respondents. Technical visits to the organization should be made, followed by sending the self-administered questionnaire to the respondents. One of the essential criteria is that respondents have access to and use management control systems in their daily decision-making processes. From a total employee pool of approximately 3,000 individuals, the study identified a population of 309 organizational managers within the company to compose the scope of this research. These individuals had the freedom to decide whether to participate in the study, leading to a sample size of 64 organizational managers. The number of respondents was deemed satisfactory, given a 21% response rate, which was considered comprehensive considering the research's objectives and the company's profile.

6 Results Analysis

The respondents' profile is predominantly male (92%), totaling 59 male respondents and 3 female respondents out of the 64 participants. Among the respondents, 46% hold a bachelor's degree, with 33% of those having completed postgraduate or MBA programs. Additionally, 15% of the sample possess a technical degree or have completed high school, while 10% were pursuing higher education. The majority (73.4%) fall within the age range of 36 to 50 years, with 5% of the sample being aged up to 35 years, 13% between 51 and 55 years, 5% between 55 and 60 years, and 2% above 60 years. It was observed that 91% of the sample has been employed at the company for over 10 years. In terms of hierarchical level, 52% of the respondents (33 individuals) hold director positions, while the others occupy roles in upper management (11%), managerial positions (33%), supervisory roles (2%), and coordination positions (2%).

6.1 Measurement Model Analysis

The use of reflective indicators was chosen based on the theoretical framework, assuming that their construction is associated with the covariance of the variables of their respective indicators (Hair et al., 2017). The SmartPLS® software v.3.2.7 was utilized to conduct Confirmatory Factor Analysis (CFA), connecting all constructs together (Brown, 2006). Subsequently, the measurement model was run using factor weighting (Ringle et al., 2015), followed by an analysis of convergent validity, discriminant validity, and reliability.

Table 2 - Correlation matrix with first-order constructs

	SC	SR	SD	SI	VE	PP	AO	CO	IC	TD	LD	FH	PE	RD
Belief System (SC)	0,867													
Restriction System (SR)	0,786	0,747												
Diagnostic Use of Systems (SD)	0,719	0,652	0,718											
Interactive Use of Systems (SI)	0,682	0,636	0,675	0,825										
Strategic Vision (VE)	0,701	0,693	0,696	0,721	0,825									
Proactive Posture (PP)	0,745	0,694	0,744	0,671	0,789	0,887								
Organizational Learning (AO)	0,752	0,707	0,708	0,714	0,737	0,759	0,894							
Organizational Communication (CO)	0,710	0,704	0,708	0,723	0,732	0,848	0,831	0,851						
Innovation and Creativity (IC)	0,503	0,460	0,467	0,529	0,532	0,557	0,700	0,679	0,838					
Decision Making Autonomy (TD)	0,617	0,535	0,532	0,427	0,569	0,715	0,674	0,723	0,723	0,849				
Leadership (LD)	0,789	0,744	0,712	0,706	0,781	0,830	0,810	0,839	0,633	0,736	0,891			
Human Factor (FH)	0,715	0,749	0,622	0,686	0,775	0,732	0,806	0,773	0,559	0,599	0,817	0,863		
Effective Partnerships (PE)	0,709	0,714	0,659	0,675	0,733	0,742	0,792	0,772	0,621	0,622	0,755	0,859	0,914	
Available Resources (RD)	0,517	0,548	0,532	0,514	0,513	0,620	0,663	0,646	0,657	0,582	0,621	0,511	0,631	0,904
Cronbach's Alpha	0,890	0,631	0,756	0,883	0,880	0,932	0,916	0,904	0,857	0,871	0,913	0,913	0,933	0,925
Composite Reliability	0,924	0,787	0,837	0,914	0,913	0,949	0,941	0,929	0,904	0,912	0,939	0,936	0,953	0,947
Average Variance Extracted (AVE)	0,751	0,558	0,516	0,680	0,681	0,787	0,799	0,724	0,703	0,722	0,793	0,744	0,835	0,817

Note 1: The values on the diagonal are the square root of the AVE.

Note 2: Correlation values greater than |0.246| are significant at 5% and above |0.319| are significant at 1%.

Note 3: All constructs were measured with 5-point scales (1 to 5).

Source: Developed by the authors.

In the last row of Table 2, the Average Variance Extracted (AVE) values of the first-order latent variables are observed. Even the latent variables with convergent validity issues at the indicator level have an Average Variance Extracted greater than 50%, meeting the criteria for convergent validity for the model as a whole (Hair et al., 2017).

Furthermore, by examining the diagonal of Table 2, which represents the square root of the Average Variance Extracted, it can be observed that all the first-order latent variables showed adequate convergent validity concerning the constructs with loadings above 0.7. Therefore, the decision was made to retain all indicators in the model, prioritizing the content validity of the investigated model.

A matrix of cross-loadings, as illustrated in Tables 3 and 4, allows for examining the convergent validity at the indicator level. Upon analysis, it was noted that out of the 62 indicators used in the model, 4 (four) showed issues with convergent validity – SR3 (-0.026), SD3 (0.618), SD5 (0.470), and VE1 (0.685) – as their factor loadings were below 0.7, following Hair et al. (2017). These results might be linked to semantic adaptation in the questionnaire to suit the cultural needs of the specific company and the fact that the SR3 item wasn't observed in the investigated population, as it was statistically insignificant, showing a negative value. Two instruments were employed to evaluate discriminant validity: the cross-loading matrix (Tables 3 and 4) and the correlation matrix (Table 2). Items with unsatisfactory convergent validity demonstrated high cross-loadings with other indicators, reducing discriminant validity. These items were potential candidates for removal in the adjusted model. However, following a combined analysis between the cross-loading matrix at the indicator level and the correlation matrix, it was decided to prioritize the content validity of the investigated model, keeping these indicators in the measurement model. This was done to prioritize study replicability, considering that the instrument measuring the Control System based on Simons' (1995) control levers is already established, and future replications might yield improved results.

Table 3 - Factor Loading Matrix representing the factors of the Management Control System construct and their respective measurement items (variables)

1ST ORDER LATENT VARIABLES			SC	SR	SD	SI	VE	PP	AO	CO	IC	TD	LD	FH	PE	RD
Belief System (SC)	SC1	The mission clearly communicates the company's core values to its team.	0,8660	0,6900	0,6600	0,5690	0,6280	0,6720	0,6930	0,6350	0,5170	0,6030	0,7190	0,5850	0,6240	0,4550
	SC2	Top managers communicate core values to their team.	0,8710	0,6720	0,6200	0,5710	0,5870	0,6310	0,6370	0,6000	0,3460	0,4680	0,6430	0,6380	0,5620	0,3970
	SC3	Your team is aware of the organization's core values, purpose and vision.	0,8630	0,6970	0,6320	0,5880	0,5590	0,5960	0,6170	0,6030	0,3950	0,4870	0,6560	0,5720	0,5700	0,4040
	SC4	In times of adversity, the mission/vision is observed in decision making.	0,8670	0,6660	0,5810	0,6350	0,6520	0,6780	0,6570	0,6220	0,4750	0,5730	0,7110	0,6800	0,6930	0,5290
Restriction System (SR)	SR1	Instruments (such as code of ethics, guidelines for directing operations, compliance policies) inform about behaviors that are outside the limits acceptable by the company.	0,7750	0,9040	0,5990	0,5470	0,5760	0,6570	0,6020	0,6290	0,3460	0,5200	0,6840	0,6540	0,5820	0,4630
	SR2	The organization communicates the risks to be avoided that could cause adversity.	0,6420	0,8900	0,6370	0,6060	0,6320	0,6630	0,6400	0,6800	0,5070	0,4830	0,6970	0,6810	0,6960	0,6110
	SR3	I don't know exactly everything I should do, but I'm clear about what I shouldn't do.	0,0230	- 0,0260	- 0,0230	- 0,0090	0,1450	0,0140	- 0,0390	- 0,0510	- 0,0370	- 0,0130	0,0220	- 0,1020	- 0,1130	0,0130
	SR4	Awareness of the existence of instruments (such as code of ethics, guidelines for directing operations, compliance policies) guides actions in times of adversity.	0,6160	0,7880	0,4300	0,4820	0,5910	0,4550	0,5860	0,4940	0,3220	0,3700	0,5300	0,5980	0,5600	0,3140
Diagnostic Use of System (SD)	SD1	We have formalized strategic planning.	0,5450	0,4180	0,7890	0,4990	0,5720	0,5240	0,5350	0,5150	0,4410	0,4580	0,5720	0,4220	0,4280	0,3140
	SD2	The budget is aligned with and derives from strategic planning.	0,6960	0,6840	0,8480	0,6620	0,7040	0,7580	0,6700	0,7300	0,4180	0,5230	0,7690	0,6360	0,6830	0,5600
	SD3	We have budgetary control: reports are presented with what was planned versus what was achieved; in meetings, past results and future actions are discussed.	0,3490	0,2270	0,6180	0,3110	0,2770	0,3900	0,3590	0,3850	0,2170	0,2250	0,2840	0,2610	0,2950	0,2010
	SD4	We monitor and compare results with expectations in order to anticipate adversities that impede progress towards organizational goals.	0,4800	0,3970	0,7970	0,5960	0,5040	0,5440	0,5100	0,4690	0,3000	0,3520	0,4930	0,4610	0,4750	0,3810
	SD5	The individual performance explained by budgetary control impacts the executive's variable remuneration.	0,4130	0,5200	0,4700	0,1980	0,2730	0,3170	0,3750	0,3180	0,2340	0,2410	0,2330	0,3390	0,3650	0,3640
Interactive Use of System (SI)	SI1	Operational managers are often involved with the control system.	0,3500	0,2630	0,3490	0,7460	0,4090	0,3500	0,4490	0,4490	0,2900	0,2310	0,4410	0,3650	0,3570	0,2290
	SI2	The data generated by the control system is interpreted and discussed with superiors, subordinates and peers.	0,5880	0,6220	0,6050	0,8280	0,5950	0,5590	0,5750	0,5680	0,4210	0,3810	0,6440	0,6460	0,5800	0,4160
	SI3	Regular and frequent attention is devoted to the analysis and discussion of adversities in meetings by managers at all levels.	0,5690	0,5420	0,6060	0,8520	0,6650	0,5580	0,5980	0,6500	0,6150	0,4170	0,6010	0,6350	0,6620	0,4460
	SI4	The company uses the control system to anticipate changes in order to prevent adversities from affecting its business.	0,6070	0,5080	0,4680	0,8890	0,5690	0,5140	0,5880	0,5900	0,4270	0,3080	0,5630	0,4960	0,4930	0,4300
	SI5	The organization aligns its strategy with control systems, supporting decisions in order to continuously adapt to adversities.	0,6290	0,5930	0,6720	0,8020	0,6670	0,7040	0,6880	0,6750	0,3780	0,3750	0,6160	0,6110	0,6130	0,5270

Note 1: Except for the SR3 indicator, the other indicators were significant at 1%.

Caption: SC – Belief System; SR – Restriction System; SD – Diagnostic Use of the System; SI – Interactive Use of the System; VE – Strategic Vision; PP – Proactive Posture; AO – Organizational Learning; CO – Organizational Communication; IC – Innovation and Creativity; TD – Autonomy in Decision Making; LD – Leadership; FH – Human Factor; PE – Effective Partnerships; RD – Available Resources.

Source: Prepared by the authors

Table 4 - Factor Loading Matrix representing the factors of the Strategic Resilience construct and their respective measurement items (variables)

1ST ORDER LATENT VARIABLES			VE	PP	AO	CO	IC
Strategic Vision (VE)	VE1	We have a broad view of the organization/business as a whole.	0,6850	0,4790	0,4800	0,4640	0,2600
	VE2	We dedicate time and energy to regularly reevaluate the goals to be achieved and explore new strategic options, which allows us to constantly change the direction of the organization.	0,7910	0,6230	0,5060	0,5070	0,4030
	VE3	Aspects of change are identified as new opportunities for the organization.	0,9240	0,7810	0,7720	0,7540	0,5840
	VE4	We have the conditions and capacity to recognize the vulnerabilities and weaknesses of the business to adjust to the new reality.	0,7910	0,5880	0,4640	0,5200	0,3680
	VE5	A broad understanding of the organization and its activity allows us to diagnose, interpret, understand and anticipate adversities, events and changes in the business scenario.	0,9110	0,7310	0,7390	0,7100	0,5100
Proactive Posture (PP)	PP1	We have a structure that allows us to act quickly and effectively in response to unexpected opportunities and events.	0,5790	0,8500	0,5870	0,6730	0,4810
	PP2	We have a variety of competitive actions available to adopt in response to unexpected and timely changes occurring in the market.	0,7350	0,8600	0,6480	0,6990	0,4250
	PP3	We make decisions and make investments preventatively to ensure that we can benefit from future situations that may arise in our organization.	0,6940	0,9220	0,6200	0,7610	0,4590
	PP4	Our organization proactively monitors what is happening in the industry to act early on emerging issues.	0,7290	0,8800	0,7550	0,7920	0,5290
	PP5	We seek opportunities for growth in the face of adversity.	0,7490	0,9220	0,7410	0,8210	0,5670
Organizational Learning (AO)	AO1	During adversity, we are able to identify a problem, learn about it, present a solution and implement the solution.	0,7030	0,6200	0,8720	0,7190	0,6150
	AO2	We learn lessons from the past and ensure that these lessons are carried out in the future as we evolve and adapt to new situations.	0,6500	0,6550	0,9050	0,7580	0,6320
	AO3	We have organizational structures that are designed to promote learning and change behaviors based on new information and new insights.	0,6180	0,7630	0,8860	0,7280	0,6350
	AO4	We have management practices and organizational norms that encourage questioning what is happening in a way that requires a solid understanding of reality.	0,6700	0,6740	0,9130	0,7660	0,6200
Organizational Communication (CO)	CO1	The communication process shares organizational direction and strategies at different hierarchical levels.	0,6620	0,7960	0,7140	0,8990	0,5700
	CO2	We have a common and prevalent language (i.e. words, images and stories) that implies capability, influence, competence, consistent core values and a clear sense of direction in our organization.	0,6580	0,7170	0,7740	0,8790	0,5230
	CO3	The information system, by providing quality information, supports quick and effective decision making.	0,6350	0,7500	0,7880	0,8450	0,7100
	CO4	Employees are trained to use the system, know what information to access in critical situations and are aware of the implications for possible solutions.	0,5560	0,7090	0,6200	0,8580	0,5850
	CO5	Crucial information is available through different mediums.	0,5980	0,6230	0,6230	0,7680	0,4950
Innovation/Creativity (IC)	IC1	We are encouraged to have an entrepreneurial spirit aiming for change.	0,4860	0,4820	0,6560	0,6380	0,9090
	IC2	We have the ability to use knowledge in an innovative and creative way to solve problems.	0,5180	0,5440	0,6480	0,6010	0,8010
	IC3	We are encouraged to be creative and look for opportunities to develop new skills, rather than focusing on standardization.	0,4490	0,4880	0,6180	0,6190	0,9040
	IC4	We are rewarded for "thinking outside the box."	0,2930	0,3200	0,3680	0,3710	0,7260
1ST ORDER LATENT VARIABLES			TD	LD	FH	PE	RD
Autonomy in the Decision Making(TD)	TD1	Leaders delegate responsibilities and authority to their team, allowing professionals autonomy to make decisions.	0,8960	0,7480	0,6180	0,6220	0,5210
	TD2	We share decision making widely.	0,8610	0,5380	0,4030	0,4320	0,3800
	TD3	We can make difficult decisions quickly.	0,7950	0,5430	0,4320	0,5480	0,5990
	TD4	If problems occur, employees have direct access to someone with authority who can make decisions.	0,8420	0,6380	0,5460	0,4890	0,4690
Leadership (LD)	LD1	Leaders are open to continuous changes in the organization's strategies and new challenges; they consider change as an opportunity.	0,6670	0,9200	0,7910	0,7270	0,6000
	LD2	Managers understand leadership as their own example.	0,6510	0,8540	0,6490	0,6300	0,5240
	LD3	Leadership values good relationships and encourages employees to discuss problems with their managers.	0,6060	0,8860	0,7890	0,7060	0,5090
	LD4	Leadership generates constant feedback and develops open communication between the leader and his team.	0,7000	0,9010	0,6730	0,6210	0,5780
Human Factor (FH)	FH1	People establish relationships with other people allowing the sharing of resources, objectives, knowledge, information and practices of mutual respect.	0,5800	0,7360	0,8750	0,7230	0,4350
	FH2	Each member of the organization has the responsibility to ensure that organizational interests are achieved.	0,5450	0,7440	0,8890	0,8080	0,5700
	FH3	We work with others regardless of departmental and organizational boundaries.	0,4020	0,6000	0,7700	0,6820	0,3470
	FH4	People in the organization feel responsible for the effectiveness of the organization.	0,5250	0,7270	0,9110	0,7650	0,3930
	FH5	People in the organization seek information, request help, admit that they made mistakes and/or generate critical feedback in the development of their activities.	0,5150	0,7060	0,8620	0,7190	0,4370
Effective Partnerships (PE)	PE1	We have strategic alliances and good relationships with our stakeholders to guarantee necessary resources to support change initiatives.	0,5790	0,7060	0,7630	0,9090	0,5860
	PE2	We ensure that connections with various stakeholders are maintained, thus strengthening social capital beyond the company's borders.	0,6060	0,7610	0,8290	0,9490	0,6470
	PE3	We understand how connected we are to our stakeholders and actively manage both these partnerships and the possibility of gaining new ones.	0,6050	0,6960	0,8390	0,9450	0,5690
	PE4	We understand how our partners' actions affect our ability to respond in the event of adversity.	0,4750	0,5840	0,7000	0,8490	0,4960
Available Resources (RD)	RD1	We are aware of the internal and external resources available when making a decision.	0,5750	0,5080	0,3810	0,5460	0,8790
	RD2	We reallocate resources to new products and projects.	0,4430	0,5630	0,5170	0,5890	0,9050
	RD3	We maintain sufficient resources to absorb unexpected changes.	0,5210	0,5730	0,4290	0,5350	0,9160
		We are quick to obtain approval for additional resources to get the job done in an adversity situation.	0,5650	0,6000	0,5140	0,6110	0,9160

Note 1: All indicators were significant at 1%. Note 2: The complete Factor Loading matrix is available from the authors.
Caption: SC – Belief System; SR – Restriction System; SD – Diagnostic Use of the System; SI – Interactive Use of the System; VE – Strategic Vision; PP – Proactive Posture; AO – Organizational Learning; CO – Organizational Communication; IC – Innovation and Creativity; TD – Autonomy in Decision Making; LD – Leadership; FH – Human Factor; PE – Effective Partnerships; RD – Available Resources.
Source: Prepared by the authors

The indicators VE1 (0.685), CO5 (0.768), and FH3 (0.770), measuring the latent variable Strategic Resilience, showed issues with discriminant validity, as seen in Table 4: It was chosen to retain these items in the measurement model, despite their high cross-loadings with various indicators in the model. This decision is justified by Hair et al. (2017), as they argue that although there is a reduction in discriminant validity, it occurs due to the common cause among them. The use of the reflexive measurement model assumes that all items reflect the same construct, in this case, strategic resilience, and therefore are highly correlated with each other.

Upon analyzing Table 2, the correlation matrix, it is evident that the discriminant validity holds for most first-order latent variables. The diagonal values, representing the square root of the average variance extracted (AVE), are greater than the off-diagonal values (correlations), as affirmed by Hair et al. (2017). However, there are four correlations that raise concerns: (i) Belief Systems and Restriction Systems; (ii) Belief Systems and Diagnostic Use System; (iii) Diagnostic Use System and Proactive Posture; and (iv) Restriction System and Human Factor. In the first two cases, the correlation exceeded the square root of AVE, indicating a lack of discriminant validity between them. According to Hair et al. (2017), in the present model, where latent variables are used as reflexive indicators of the same construct, this is not a problem since these situations measure the Management Control System construct. Furthermore, calculating the corrected correlation coefficient (unbiased correlation) justified the decision to retain items with discriminant validity issues in the proposed model since all the uncorrelated correlation values were less than 1. This supports the use of the original measurement model.

The reliability was tested using Cronbach's alpha and composite reliability, showing values ranging from 0.631 to 0.933 and from 0.787 to 0.953, respectively. As shown in Table 2, only the Restriction Systems dimension displayed an alpha value below 0.7, with a composite reliability of 0.787. However, this value is close to 0.8, which, according to Hair et al. (2017), is the most appropriate measure to ensure the internal consistency of the model when using PLS-PM.

Upon reviewing Table 2, it is evident that the four dimensions of the MCS exhibited high correlations among themselves (ranging from 0.636 to 0.786), justifying their grouping as a second-order latent variable. This is also observed for the dimensions that make up the RE (Resilience Strategic), with first-order constructs showing correlations between 0.513 and 0.848. The measurement model of the second-order variables followed the guidelines provided by Hair et al. (2017) for the use of SmartPLS®, repeating the indicators comprising the first-order variables in the second-order latent variables. Table 5 demonstrates the presence of convergent validity, discriminant validity, and reliability at the level of the second-order latent variables.

Table 5 - Correlation matrix with second-order constructs

	MCS	RE
Management Control Systems (MCS)	0,874	
Strategic Resilience (RE)	0,874	0,857
Composite Reliability	0,928	0,982
Average Variance Extracted (AVE)	0,764	0,735

Note 1: The values on the diagonal are the square root of the AVE.
Note 2: Correlation values greater than |0.246| are significant at 5% and above |0.319| are significant at 1%.
Note 3: All constructs were measured with 5-point scales (1 to 5).
Source: Prepared by the authors.

In Table 5, it is evident that the second-order latent variables demonstrated an extracted mean variance greater than 0.735, exceeding the minimum threshold of 0.5. The diagonal values of the matrix are higher than the off-diagonal values (correlations), indicating discriminant validity. Additionally, the composite reliability exhibited values higher than 0.92, confirming that the second-order latent variables possess convergent validity, discriminant validity, and reliability.

6.2 Structural Model Analysis and Method Bias

The structural model was estimated using the partial least squares path modeling method (PLS-PM) via SmartPLS 3.2.7 software. The p-values were estimated through bootstrap with 5,000 resamples, using the option of no sign changes. It's noteworthy that all indicators were retained in the model. The choice of data treatment method was due to the sample size being much smaller than that required for covariance-based estimation, the possibility of testing relationships between latent variables without assuming multivariate normality, and the capability to handle complex models (Hair et al., 2017).

The structural model aimed to identify the minimum significant detectable R2 value, following the classification by Cohen (1977, p. 413-414): 2% as low, 13% as medium, and 26% as large. Using G*Power ® version 3.1.9.2, the estimated value for the tested model was 11.23%. Therefore, considering a statistical power of 80% and a significance level of 5%, any R2 value higher than this is detected as significant (Faul et al., 2007). Furthermore, in G*Power's sensitivity analysis, there is evidence that for a sample of 64 respondents, any effect larger than 12.66% will be detected as significant at 5% with a statistical power of 80%.

The analysis of the structural model was performed considering the estimation involving second-order variables (Management Control System and Strategic Resilience), the inclusion of control variables (the area in which the respondent is allocated), and the assessment of method bias.

The bias of the method, also called Measured Latent

Marker Variable (MLMV), causes an overestimated or underestimated correlation between the dependent variable and the independent variables when collected from the same respondents, and the same scale style. According to Chin et al. (2013), method bias can be assessed and eliminated by including in the model a formative latent variable called MLMV by researchers, containing 4 to 12 items, using the same measurement scale to measure its elements, but which do not include the same content as the variables included in the research model. Table 6 presents the eight formative indicators of MLMV that were used in this research to measure method bias, with answers on an agreement scale from 1 to 5, with 1 being completely disagree, 5 being completely agree, and 0 being I don't know or does not apply.

Table 6 - Formative indicators of the method bias latent variable (MLMV).

MLMV INDICATORS	REFERENCES
I use the management control system to improve my productivity.	Aguiar et al., (2009).
I feel confident contributing to discussions about my company's plans for the future.	Cavalcante (2013).
Currently I see myself in a successful phase at work.	
I usually take stressful things at work in stride.	
Right now, I think I can achieve the work goals I set for myself.	
I am optimistic about what will happen to me in the future in my work.	
The organization's mission is aligned with my values.	Chen et al. (2014).
When it comes to my career, I'm the one who makes the decisions.	Cordeiro and Albuquerque (2016).

Source: Prepared by the authors

6.3 Hypothesis testing

Below are the results of the proposed structural model: (i) to test H1; (ii) to assess the effects of the control variable; and (iii) to evaluate and eliminate the method bias. It was observed that the Variance Inflation Index (VIF) was less than 5 for the structural model, indicating an acceptable level of multicollinearity, according to Hair et al. (2017). However, as discussed earlier in the correlation matrix of the first-order variables (Table 2), some variables displayed high values among themselves, suggesting that the existing collinearity might be explained by their high correlation due to a common cause.

The effect of the control variable "Department" representing the respondent's participation in their department did not show a significant relationship with Strategic Resilience, despite having individuals associated with departments directly involved in the organization's management process and others focused on operational activities.

In Figure 2, the variable MLMV was included in the model to estimate and remove the effect of method bias, as outlined by Chin et al. (2013). The results presented are standardized structural coefficients after removing the method bias. It was observed that there was an overestimation of the structural coefficient at 0.874, as after removing the method bias, the structural coefficient shifted to 0.523. The model illustrated in Figure 2 shows a statistically significant ($p < 0.001$) bias-free structural coefficient supporting hypothesis H1. It's noteworthy that an increase in the use of the MCS is associated with a rise in Strategic Resilience (R^2 equals 83%). The model's explanatory power is evidenced by the adjusted R^2, which was 82.1%, reflecting a large effect, according to Cohen's classification (1977).

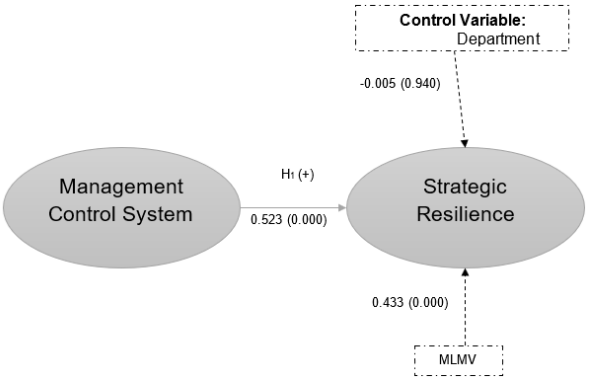


Figure 2 - Structural model
Source: Prepared by the authors

The results suggest that the organization's use of the management control system, as per Simons' (1995) proposed types of use, has a high explanatory power for strategic resilience. Overall, the findings demonstrate that the company facilitates the levers through various control mechanisms formalized within the organization, such as: the code of ethics, guidelines for operational direction and conduct, risk management policies; the organization's strategic guidelines disseminate the mission, values, and vision; the strategic planning is formalized, and the budget is aligned with the strategic plan; the company conducts budgetary control by comparing planned versus actual figures; past results and future actions are discussed in meetings; the organization monitors these instruments in the investigated directorates, and operational managers are frequently involved with the control system to anticipate adversities that hinder progress towards organizational goals.

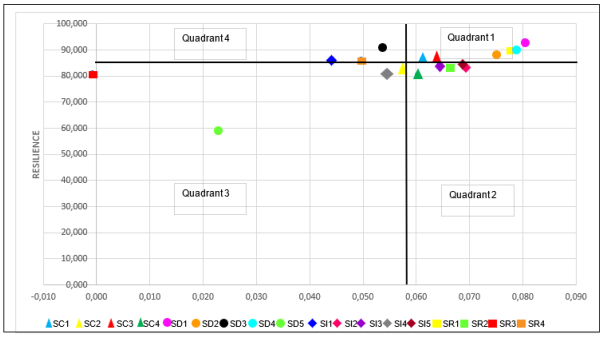
6.4 Priority map

The Priority Map cross-references the non-standardized structural coefficients with standardized factor scores from 0 to 100, complementing the results presented by bootstrapping with random resampling using 5,000 repetitions, employing the option without sign change with a 95% confidence interval (Hair et al., 2017), where evidence shows that the coefficients are statistically significant. Specifically for this research, the Management Control System (MCS) has a significant and positive effect on Strategic Resilience (RE). In this regard, it is necessary to analyze the priority map at the indicator level to assess which indicators of the MCS show higher and lower priority for actions by the organization's management.

Each element in Figure 3 represents an indicator of the independent variable, as represented by the second-order latent variable named Management Control System. According to Mikulić et al. (2016), items positioned to the right hold higher importance, whereas those placed more to the left are of lesser significance.

In practice, managers focus their decision-making on investments and resources to improve the items presented in Quadrant 2, considering that the elements in this quadrant are important and have a higher growth margin compared to those in Quadrant 1. It's important to highlight that Quadrant 3 encompasses elements with low priority, while Quadrant 4 comprises saturated elements, which means they exhibit high performance in the dependent variable but have low importance for further development (Mikulić et al., 2016).

Figure 3 - Priority map at indicator level



Note 1: Although the scale is a Likert scale of 1 to 5 points, SmartPLS 3.2.7 standardizes the factor scores to the range of 0 to 100.
Note 2: For greater understanding of the indicators, see Table 3.
Caption: SC – Belief System; SD – Diagnostic Use of the System; SI – Interactive Use of the System; SR – Restriction System.
Source: Prepared by the authors.

It is observed that most indicators have a high level of importance in the operationalization of strategic resilience, which results in a significant influence on strategic resilience. However, they don't show much room for improvement since they are very close to 100%. Of the 18 MCS indicators, 9 showed performance above average, significantly impacting strategic resilience. Additionally, 11 indicators have a significantly high level of importance, positioned in Quadrants 1 and 2, requiring more practical interest from a research standpoint.

7 Conclusions

By confirming the hypothesis of this research, resilience is established as a strategic element in the business model of the company under study. The results of this research support Weick and Sutcliffe's (2007) study, as they showed that resilience is embedded in organizational processes, being promoted in organizations that have management practices allowing managers to question reality and influencing routines as they underpin the organization's choices in responding to adversity (Lengnick-Hall & Beck, 2005).

The research findings align with the studies conducted by Beuren and Santos (2019), Beuren et al. (2020), Frare et al. (2023), Alves et al. (2022), and Baird et al. (2023). The results reveal that higher levels of using the management control system increase the organization's capacity for strategic resilience. The findings indicate that when an organization possesses and employs a management control system, it has facilitating mechanisms: (i) to adapt in the face of adversity; (ii) to drive the changes required by the organizational context and competitive environment; (iii) to achieve strategic innovation (Davila & Foster, 2008); and (iv) to promote resilience as a competitive advantage (Bhamra et al., 2011; Lengnick-Hall et al., 2011; Salgado, 2013; Nascimento, 2014; Starr et al., 2003).

The surveyed company has put considerable effort into shaping a comprehensive management control system to: (i) express values that are central to the organization over an extended period, (ii) have current control systems connected to present demands to inspire employees to act proactively, (iii) seek new opportunities, (iv) remain vigilant about risks, and (v) ensure compliance with organizational goals. This occurs in a way that anticipates adversities and allows the organization to be prepared for changes, facilitating continuous adaptation to adversities, thereby exerting a positive effect on strategic resilience (Path Coefficient = 0.523; $p < 0.000$).

It was found that the management control system allows the company to: (i) manage resilience factors, especially focusing on information management during times of crisis and adversity, ensuring that individuals involved in the decision-making process have access to correct, useful information delivered promptly (Stephenson, 2010), acknowledging that each manager has specific information needs (Nascimento, 2014); and (ii) understand how the interrelations, interdependencies, and actions of partners (government, suppliers, competitors, among others) impact their ability to respond to adversity.

It was observed that the researched organization leveraged resilience into a competitive advantage, even during a time of high tension and challenges. The company ensured the alignment of established strategies, maintaining its market share and leadership in Product A, showing a growth rate exceeding 11% compared to the previous year. The company faced the managerial challenge proposed by Annarelli and Nonino (2016), transforming organizational resilience into a competitive advantage by operating with limited resources, proactive strategy, and management control mechanisms that provided agility in decision-making processes and operational effectiveness. This company can be defined as a resilient organization according to the tenets of Starr et al. (2003) and Salgado (2013), as it effectively aligns

its strategy, operations, management control system, and governance structure, supporting the decision-making process and continually adapting to adversities.

We suggest a longitudinal study that investigates the period before and after adversity, examining the role of the management control system, as well as the development of resilience elements within each.

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