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Business Process Management Maturity as a Driver of Organizational Resilience: An Empirical SEM Analysis

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Abstract

In today's business landscape, organizations increasingly need to adopt modern process management approaches to gain a competitive advantage and improve performance. This study investigates these relationships, focusing specifically on performance effects within the organizational resilience (OR) dimension. The authors obtained 82 valid survey responses from professionals in operational roles. Data analysis was conducted using structural equation modeling (SEM) based on the partial least squares (PLS) approach. The results demonstrate that higher levels of business process management maturity positively affect OR behavior, with the strongest effect observed at the highest maturity stage. This indicates that organizational resilience is fundamentally linked to well-established and mature process structures. The model developed in this study explains 78.5% of OR. The study clarifies the degree to which process management affects OR outcomes. Although prior literature identifies five first-order constructs of process maturity, only the "innovated" dimension was found to be statistically meaningful in this research. Organizations that achieve advanced levels of process management maturity are better positioned to enhance OR, as structured process management reduces supply chain vulnerability and increases responsiveness to change.

Keywords: Process management, Process maturity, Organizational resilience, Performance, Structural equations

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Introduction

Over the last thirty years, the business environment has been significantly reshaped. These transformations are largely driven by technological progress and innovation, which introduce complex strategic and operational pressures for both public and private sector organizations [1-3].

A major contemporary challenge concerns the development of effective processes and the refinement of managerial planning and decision-making systems. Such improvements can serve as a source of competitive advantage by enhancing efficiency, stimulating innovation, and generating value for both organizations and their internal and external stakeholders [4, 5]. Within this setting, business process management (BPM) has emerged as a key approach to support decision-making and improve organizational performance. BPM is widely recognized as valuable because its advantages are observable across different contexts, making it an important contributor to competitive positioning [6-12].

From the perspective of organizational performance, several interpretations exist regarding how outcomes should be assessed. In this study, performance is examined through organizational resilience (OR), a construct that has gained substantial attention in both academic and practitioner-oriented literature [13-19]. In this sense, given that process management maturity is expected to contribute positively to performance outcomes, it can also be considered indirectly related to OR. This view is supported by previous studies that have reported positive links between process maturity and different performance dimensions, including [5, 8, 20-23], among others.

Investigating this relationship is particularly relevant in business environments, as more resilient processes help organizations reduce the negative effects of unexpected disruptions and operational disturbances, which may otherwise lead to severe consequences [14, 17, 24-26].

In light of the global disruption caused by the COVID-19 pandemic [27, 28], research has highlighted how organizations worldwide can respond to crises, disruptions, and losses that directly affect operational continuity and organizational structures. This topic has gained strong practical importance, especially for managers responsible for organizational governance. Assessing process maturity levels and strengthening them to deal with adverse conditions can help organizations develop effective responses to emerging market demands, many of which have intensified due to the pandemic's effects [29-32].

Therefore, this study is motivated by the following research question: What impact does business process management maturity (BPMM) have on OR? Accordingly, the main objective is to examine these relationships by considering performance outcomes within the OR dimension.

Development of hypothesis and research model

Business process management maturity (BPMM)

BPMM is based on the premise that organizational processes evolve through identifiable life-cycle stages that can be defined, governed, assessed, and systematically controlled over time [33, 34]. As processes progress to higher maturity levels, organizations typically gain improved command over outcomes, enhanced precision in estimating objectives, costs, and performance indicators, and greater success in achieving intended goals [20, 35, 36].

Maturity frameworks are continuously refined and function as diagnostic tools that allow organizations to evaluate their processes according to their degree of formalization, documentation, governance, evaluation, and optimization [5, 8, 11, 20, 23, 36, 37]. In particular, the business process maturity model developed by the Object Management Group (OMG) and adopted here through the adaptation proposed by [23] identifies five progressive maturity stages that serve as the theoretical foundation for this variable.

At Level 1 (initial), process governance is virtually absent, with activities carried out in an irregular, often improvised manner, leading to unpredictable outcomes. Work relies heavily on individual initiative, with no formalized process structure or organizational alignment. At Level 2 (managed), efforts focus on stabilizing operations within functional units, ensuring tasks are executed consistently and repeatably, even though similar units may still use different methods [23].

At Level 3 (standardized), organizations begin consolidating processes based on identified best practices across teams, while also defining guidelines that allow adaptation to different operational contexts. This standardization enables efficiency gains and supports organizational learning through shared metrics and collective experience. At Level 4 (predictable), standardized processes are further leveraged and continuously monitored, with statistical control applied across workflows to manage variability and enable reliable forecasting based on intermediate process indicators. At Level 5 (innovated), organizations pursue continuous, forward-looking improvements, emphasizing innovation initiatives to bridge the gap between existing capabilities and those required to achieve strategic goals [23].

Collectively, these stages illustrate how BPM capability evolves incrementally, reflecting an organization's ability to improve its process management systematically. This progression moves from fragmented and undefined practices (level 1) to localized repetition within units (level 2), to organization-wide standardization (level 3), followed by data-driven predictability and control (level 4), and ultimately to continuous innovation and refinement (level 5) [23].

Accordingly, BPMM can be defined as the extent to which organizations advance in structuring and improving their process management practices during operational execution. These practices are distributed across maturity levels that collectively represent the organization's capacity to effectively govern its business processes [5, 8, 11, 23, 37, 38].

Organizational resilience (OR)

Resilience, according to prior research, refers to a bundle of organizational capabilities that, when developed, enhance overall organizational strength and adaptability [14, 16, 17, 19, 25, 39, 40] describe it as the organization's ability to detect disruptions, adjust its behavior, and respond rapidly to disturbances within its supply chain. [40, 41] define it as the capacity to persist, adjust, and expand in the face of volatile and uncertain conditions. Similarly [42], view resilience as the ability to take preventive action before disruptions escalate or to recover after crises, restoring performance within an acceptable timeframe.

These perspectives suggest that resilient organizations combine anticipatory and reactive capabilities, enabling them to prepare for disruptions and recover effectively in the face of uncertainty [42]. However [26], extend this view by arguing that resilience is not limited to anticipation and recovery; it also requires adaptability and flexibility in response to both favorable and unfavorable environmental shifts. From this standpoint, resilience includes adaptability, flexibility, continuity, and recovery capacity. Supporting this argument [43], emphasizes that resilient processes are inherently agile and flexible, allowing rapid reconfiguration. This adaptive capability enables organizations and supply chains to recover after disruptions and either return to prior performance levels or reach improved operational states.

In addition, based on an extensive systematic review [15], observes that resilience at the organizational level is commonly used to describe firms that respond more quickly, recover more effectively, or develop unconventional strategies when confronted with threats. The concept is generally associated with robustness, endurance, and recovery under adverse conditions.

Although the literature indicates that resilience is a well-established theoretical construct [15, 26, 42], it is often operationalized in terms of measurable dimensions and defining attributes. Following [40, 41], the conceptual scope of OR adopted in this study is defined as the ability to survive, adapt, and expand under turbulent conditions. More specifically, it encompasses the capabilities to anticipate disruptions, respond to disturbances, and recover from them, while maintaining structural stability, functional continuity, and desired levels of operational performance [26]. This definition constitutes the operational understanding of resilience used in this research.

Theoretical relationship between BPMM and OR

To frame the link between BPMM and organizational performance, particularly in terms of OR, this study relies on dynamic capabilities theory as its conceptual foundation. This perspective is appropriate because, as originally proposed by [44], organizational capabilities are not fixed but can be continuously developed and reconfigured to remain aligned with environmental change. In this regard, firms can integrate, adjust, and reorganize their resources, competencies, and functional skills to address external shifts and emerging demands [45, 46]. When applied to disruptive or adverse contexts, dynamic capabilities become especially important for resilience-related performance outcomes. They enable organizations to cope with environmental turbulence through ongoing resource reconfiguration, refinement of organizational practices, and coordination of core activities, thereby supporting sustained performance advantages [34, 47].

According to [48], BPM plays a key role in enabling these capabilities by providing a structured set of organizational resources that support the management of both present and future challenges. This is achieved through the implementation of guiding principles, such as employee training and engagement, clear purpose definition, and the use of technology. These elements are essential for strengthening, shaping, and advancing the maturity of process management practices within organizations. In this sense, BPM supports the systematic redesign of how processes are executed, especially when disruptions, breakdowns, or external shocks expose organizational weaknesses. As a result, it contributes to improved performance and the generation of competitive benefits across multiple dimensions [48].

In addition, organizations must ensure that their process structures are compatible with environments characterized by volatility, complexity, and uncertainty, since contextual adaptability is embedded in BPM principles [49]. In such turbulent conditions [49], emphasize the need for expanding organizational capabilities, including stronger cross-functional collaboration and more effective stakeholder coordination. A stronger orientation toward change management, risk handling, analytical development, and innovation enhances the organization's capacity to respond effectively to environmental disruptions, thereby reinforcing resilience [14, 29, 31, 32]. In line with this argument [48], stress that BPM should not be limited to addressing current operational requirements, but should also foster dynamic capabilities that prepare organizations for future uncertainty and potential disruptions [44, 45].

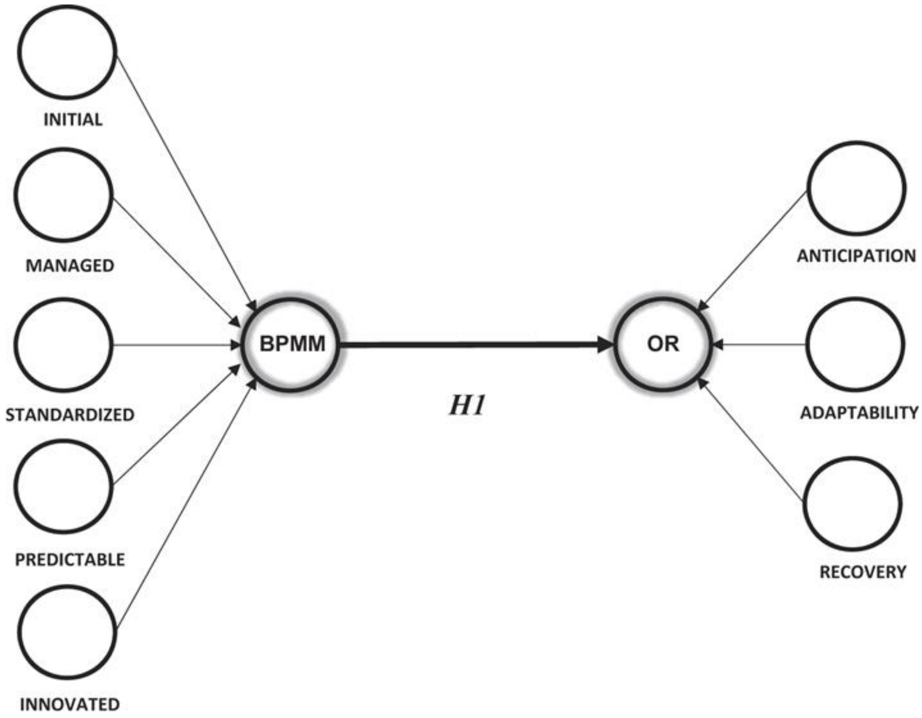
Given that process maturity reflects a distinctive organizational capability [48], it can be argued that when processes are adjusted through managerial competence and team participation (including human involvement) [35], and simultaneously aligned with contextual conditions and situational demands [49], they become strategically valuable assets for managing uncertainty. Under these conditions, such capabilities are not only valuable but also rare and difficult to replicate. Accordingly, varying levels of process maturity enable organizations to identify operational gaps and implement appropriate process reconfigurations in response to environmental pressures [23], thereby enhancing resilience outcomes.

[39-41], and [7] highlight that improving resilience typically involves establishing structured practices and mechanisms in advance, including business process management. Organizations that adopt BPM are therefore better positioned to manage instability without interrupting operational flows or service delivery. This suggests that BPM contributes to strengthening resilience capabilities not only within organizations but also across broader supply chains [9, 13, 24]. Based on this theoretical argumentation, the following hypothesis is proposed:

H1. BPMM positively impacts OR.

Presentation of the theoretical model and operationalization of variables

The research framework comprises constructs derived from the conceptual domains of BPMM and OR. As depicted in **Figure 1**, the proposed conceptual model positions BPMM as the antecedent (independent) construct, and OR as the outcome (dependent) variable.



Note(s): BPMM = Business Process Management Maturity; OR = Organizational Resilience
Source(s): Prepared by authors

Figure 1. Research model and hypothesis.

Table 1 summarizes the model's operational structure, specifying the indicators that comprise the first-order constructs.

Table 1. General system for operationalizing the research model constructs.

Formative constructs: 2nd order	Formative constructs: 1st order	Item summary	Author(s)
Business process management maturity (BPMM)	Initial: work is performed in an inconsistent and ad-hoc manner	• lack of formalized procedures • non-adherence to procedures even when they exist • multiple different ways of carrying out the same tasks	[23, 37]
	Managed: processes within units are executed in a repeatable manner	• defined methods and technologies • documented working procedures • oversight of individual projects	
	Standardized: processes are uniform, and resource allocation is defined for producing goods and services	• standardized workflows • documented procedures and objectives • formal process definitions	
	Predictable: processes are quantitatively managed to ensure consistent outcomes	• performance measurement and management • structured process control • corrective process adjustments	
	Innovated: organizational processes are continuously enhanced	• identification of issues and critical areas • goal setting for improvement • ongoing adoption of new ideas and technologies	
Organizational resilience (OR)	Anticipation: the capability to detect possible future events or conditions	• risk identification • monitoring of anomalies and deviations • early detection of disruptions • identification of emerging opportunities	[40]
	Adaptability: the ability to adjust operations in response to disruptions or opportunities	• modification of processes • simulation of processes • development and use of technologies • continuous improvement practices	
	Recovery: ability to quickly return to normal operations after disruption	• coordination of response teams • communication and information sharing • public relations management • reduction of disruption impacts	

Source(s): Prepared by the authors

Materials and Methods

To assess the effect of BPMM on OR, a quantitative survey strategy was employed, using an online questionnaire developed in Google Docs. The instrument was directed at professionals in operational roles, including executives, managers, operational supervisors, and personnel responsible for production, quality, procurement, logistics, or marketing.

The sample was drawn from organizations affiliated with the Federation of Industries of the State of Espírito Santo (FINDES). The questionnaire was constructed on established theoretical foundations and comprised 34 items in total: 4 items related to respondent and organizational profiling and 30 items measuring the research constructs. A five-point Likert scale was used, ranging from “totally disagree” to “totally agree”. Item order was randomized within the survey to reduce response bias.

The BPMM measurement instrument was adapted from [23], published in Information Systems Frontiers. The OR construct was based on [10], published in the Journal of Business Logistics.

Following instrument development, a panel of academic specialists, consisting of professors and PhD researchers with expertise in survey methodology, conducted a qualitative review of the 34 items. This expert evaluation enhanced the instrument’s clarity, scope, reliability, validity, acceptability, and usability [50]. It also helped remove redundancies, reduce ambiguity, eliminate conceptual overlaps, and mitigate potential measurement bias.

In a subsequent phase, practitioners from the field reviewed the questionnaire to improve item comprehension further, ensure clear and accessible language for respondents, and refine the instrument’s conciseness and practical applicability.

For sample size estimation, the study followed the guidelines proposed by [51] for structural equation modeling (SEM) using the partial least squares (PLS) technique. The criteria specified that: (1) the sample must be at least 10 times larger than the maximum number of formative indicators of any construct; or (2) at least 10 times larger than the highest number of structural paths directed toward a single endogenous construct. Based on these rules, a minimum of 50 responses was required. After an initial data screening to detect and resolve inconsistencies, the final dataset included 82 valid observations.

Finally, data analysis was carried out in two stages. First, SPSS Statistics 21 was used to test for normality in the data distribution and identify outliers. Then, Smart PLS-SEM 3.0 was applied to conduct structural equation modeling using the PLS algorithm [52]. The analytical procedure followed the steps outlined in **Table 2** to assess measurement quality, reliability, and the robustness of the proposed structural model.

Table 2. Data analysis procedure via Smart PLS-SEM.

Validation stages tests	Procedures reference	Parameters
Evaluation of the Formative Measurement Model (relationships between constructs and their indicators)	Multicollinearity	• TOL > 0.20• VIF < 5
	Significance and Relevance	• Outer Weight: ≤ 1/√N e• Outer Loading: ≥ 0.5• Indicator hypothesis test: p-value ≤ 0.05
Structural Model Assessment (direct and indirect relationships among constructs)	Multicollinearity	• TOL > 0.20• VIF < 5
	Significance and Relevance	• Hypothesis testing (constructs): p-value ≤ 0.05
	Coefficient of Determination (R^2)	• R^2: 0.75 (strong), 0.50 (moderate), 0.25 (weak)

Source(s): Prepared by the authors based on [51]

Results and Discussion

Sample characteristics

A slight majority of respondents (58%) held strategic-level roles, such as president, director, or manager. Regarding sector distribution, most observations (65.85%) came from service organizations, while the remainder was evenly distributed between commercial (17%) and industrial (17%) activities.

Regarding organizational age, 56.10% of firms had been operating for more than 2 decades, whereas 14.60% had been operating for 5-10 years. In terms of size, small enterprises accounted for 44% of the sample, followed by medium-sized firms (24%), while large organizations accounted for only 4%.

Analysis of the proposed model

During evaluation of the proposed model **(Table 2)**, analysis at the indicator level revealed that item q8 (linked to the first-order construct “Standardized”) needed to be excluded from the measurement specification. This decision was taken because q8 showed strong correlations with other indicators within the same construct (q7 and q9), indicating multicollinearity. The removed item referred to the existence of formally documented procedures and organization-wide objectives.

One plausible explanation is that participating organizations may not systematically formalize documentation of their processes, or that q7 (standardized procedures across the organization) and q9 (uniform processes applied across different work groups) may have been conceptually overlapping with q8, leading to redundancy and statistical collinearity. After excluding q8, the model was re-estimated, and subsequent results confirmed that all remaining indicators satisfied acceptable validity and reliability criteria.

After validation of the formative measurement models, the analysis proceeded by transforming the first-order constructs associated with the endogenous second-order construct OR into observable indicators using the Two-Stage approach [51]. This approach is necessary because the OR construct is formed by the first-order dimensions—anticipation, adaptability, and recovery—which, if left unaccounted for, tend to absorb most of the explanatory variance, potentially attenuating the effect of the higher-order predictor BPMM on OR [53]. Additional methodological details can be found in Ringle *et al*. (2012).

In a similar manner to the earlier multicollinearity assessment in the measurement model, the structural model also showed no evidence of problematic correlations among constructs (TOL > 0.20 and VIF < 5) [52], indicating adequate structural specification.

Regarding hypothesis testing, the t-test based on 81 degrees of freedom at a 5% significance level, using Bootstrapping results, confirmed that H1: BPMM positively impacts OR is statistically supported. Consequently, the null hypothesis (H0), which assumes no positive effect of BPMM on OR, is rejected, as reported in **Table 3**.

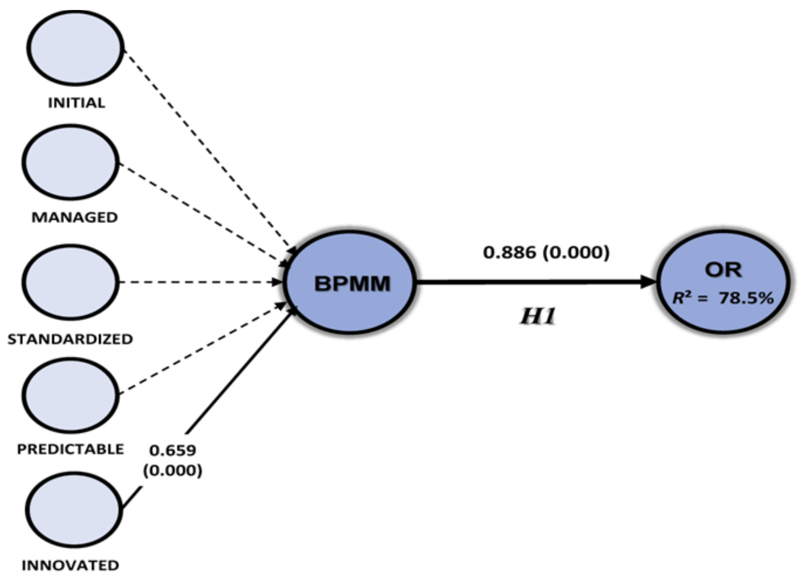
Table 3. Total effects of the structural equation - path coefficients.

Path coefficient direction	Path relationship	Path coefficient value	P-value*
Initial	→ BPMM	0.115	0.336
Managed	→ BPMM	0.176	0.243
Standardized	→ BPMM	−0.017	0.912
Predictable	→ BPMM	0.120	0.474
Innovated	→ BPMM	0.659	0.000
BPMM	→ OR	0.886	0.000

Note(s): *Significance of the path coefficients of the 1st and 2nd order constructs, p-value <0.05, when submitted to the t-test with the Bootstrapping technique, from 5,000 subsamples

Source(s): Prepared by the authors based on research data

Additional analysis of first-order constructs showed that only the highest maturity level, "innovated," achieved statistical significance and practical relevance, with a path coefficient of 0.659 (P-value 0.000) in relation to BPMM. This suggests that this dimension is the only maturity level indirectly contributing to variations in OR. The final validated model is presented in **Figure 2**.



Note(s): The dashed lines represent that the constructs were not significant to form the second-order construct BPMM

Source(s): Prepared by authors

Figure 2. Final research model.

Finally, the coefficient of determination (R^2) indicates that BPMM explains 78.5% of the variance in OR. This measure reflects the predictive power and explanatory strength of the model, with values closer to 1 indicating greater accuracy of the exogenous construct—in this case, BPMM—in explaining the endogenous construct OR [52].

Managerial and theoretical implications

The findings of this study, together with the validated hypothesis (H1), suggest that organizations operating at a BPMM level aligned with the "Innovated" stage tend to refine their processes continuously. This occurs through the systematic identification of critical business areas, the use of performance feedback, and the incorporation of new ideas and emerging technologies to enhance operational processes [1, 2, 6, 7, 9].

These results highlight the importance of establishing and sustaining guiding principles for effective business process management within organizations, as emphasized by [48]. Such principles enable firms to develop the capabilities and resources necessary to advance process maturity and influence other organizational outcomes, including resilience, which appears to be strongly dependent on well-established and mature process structures. The highest maturity level is closely associated with continuous process improvement, which supports anticipation, adaptation, and recovery in the face of disruptive events [17]. As a result, when organizations experience disruptions or operational interruptions, they are better able to return to prior performance levels or even achieve improved operational states [14, 16, 18].

From a managerial standpoint, leaders seeking to enhance the quality of business process management should focus on advancing more innovative process practices. Such progression fosters greater process flexibility and continuous improvement, driven by the systematic replacement of obsolete routines and procedures with more efficient and agile forms of execution [4, 5, 8, 11, 12, 23]. In this sense, BPMM can serve as a medium- and long-term driver of organizational performance, supporting the development of new process capabilities and gradually strengthening competencies and competitive positioning. This reinforces the idea that BPMM functions as a key explanatory foundation for understanding organizational resilience levels.

Moreover, a review of existing literature provides empirical support for the practical implications discussed in this study. For instance, research conducted by [54] in the medical device sector in Italy and Finland during 2020 demonstrated that the ability of organizations to reconfigure their resource base dynamically played a crucial role in navigating the pandemic, with this capability strongly influencing resilience outcomes. The effects of COVID-19 disrupted the downstream supply chain, requiring firms to reallocate resources in response to shifting demand. In contrast, upstream disruptions forced organizations to respond to risks and opportunities in supply markets, while downstream disturbances stimulated resource reconfiguration initiatives [54].

The current global context, marked by the COVID-19 pandemic [27, 28] and geopolitical conflicts involving major suppliers of critical inputs and raw materials worldwide [55], illustrates how organizations face periods of disruption, instability, and resource loss. These conditions can significantly affect both operational processes and organizational performance outcomes. In response, managerial actors are required to develop more adaptive and effective management practices, which partially justifies the investigation presented in this study.

Conclusion

The outcomes of this study provide significant insights from both managerial and academic viewpoints, indicating that business process management functions as a key and predictive factor in explaining variations in OR. In addressing the main research question on the effect of BPMM on OR, the findings (in line with the overall objective) demonstrate that this relationship is positive, statistically significant, and of strong magnitude. It can therefore be inferred that organizations oriented toward structured process management—those that define, document, measure, control, and optimize their business activities—are better able to endure periods of instability without losing their competitive position in the market.

From a managerial perspective, the study highlights that organizations aiming to develop resilience must strengthen their operational routines. This requires the combined support of process management practices and information technologies, alongside the development of key resilience capabilities, particularly those related to anticipating disruptions, adapting to changes, and recovering from adverse events, while preserving structural control, functional integrity, and operational continuity. This research also helps managers recognize the importance of advancing process maturity within organizational systems, given its meaningful and positive role in explaining changes in resilience levels.

Regarding theoretical implications, although resilience has become a widely discussed topic across academic literature, industry practice, public policy, and media discourse, its conceptual framing and measurement have varied considerably across prior studies. This research contributes by proposing both a clear conceptual and operational definition, enabling deeper theoretical exploration from an organizational perspective. In relation to process maturity, existing literature—supported by dynamic capabilities theory—helps explain how BPMM is embedded within organizational structures as a distinctive and evolving resource, reflected through different maturity stages. Accordingly, this study introduces construct definitions, measurement specifications, and a research proposition, contributing to the operations management and supply chain literature and supporting future empirical investigations.

With respect to limitations, this study is primarily quantitative, limiting the ability to explore variables through qualitative interpretation. If a qualitative component had been included, richer, more detailed explanatory insights could have been obtained. Nevertheless, despite this limitation, the research design fulfilled established statistical and methodological requirements appropriate for quantitative analysis.

Based on the findings and identified limitations, several directions for future research are proposed. First, future studies could examine whether the use of business analytics within organizations influences the relationship between business process management and OR [7, 9, 56] as a mediator or moderator. Additionally, further research is encouraged on risk management practices and resilience-building mechanisms in operations, at both the organizational and supply chain levels, to address existing gaps in the literature [57]. Finally, replication studies using the validated model across different industries and economic sectors are recommended, as such investigations may generate new and relevant insights into the relationships among the constructs examined in this research.

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