

Heuristic Workaround Behavior and Operational Resilience Under Rigid ERP Constraints: A Mixed-Methods Study in the Pharmaceutical Industry

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ABSTRACT

The pharmaceutical industry operates under stringent regulations requiring compliance with Standard Operating Procedures (SOPs), Good Manufacturing Practices (GMP), and Enterprise Resource Planning (ERP) systems. However, rigid ERP systems frequently create operational constraints that require employees to adopt adaptive problem-solving strategies to maintain workflow continuity. This study investigates employees' heuristic workaround behaviors, examines their mediating role in operational resilience, and explores contextual factors influencing these adaptive practices. An exploratory sequential mixed-methods design was employed, involving participatory observation and in-depth interviews with four key informants, followed by census sampling and PLS-SEM analysis of 101 operational employees at a pharmaceutical company in Sidoarjo, East Java. Four workaround behaviors were identified: ERP data adaptation, manual hard-file backup, cash-based incentive payments for interns outside the payroll system, and transaction input before formal purchase order processing. Structural analysis showed that heuristic workaround behavior fully mediates the relationship between ERP rigidity and operational resilience ($\beta = 0.443$, $p < 0.001$). These findings demonstrate that employees' collective cognitive adaptability is a critical driver of operational resilience beyond formal organizational systems and should be strategically recognized and managed.

1. INTRODUCTION

The pharmaceutical industry is commonly regarded as one of the most strictly regulated sectors in the world. Its operational complexity is shaped not only by demanding production processes, but also by extensive compliance requirements under Good Manufacturing Practice (GMP/CPOB) standards and mandatory Standard Operating Procedures (SOPs) that regulate activities across each operational unit. In Indonesia, pharmaceutical companies operate under the supervision of the National Agency of Drug and Food Control (BPOM), which applies GMP principles aligned with international standards. As a result, the industry functions within a highly standardized regulatory environment. However, this environment may become operationally vulnerable when formal systems do not work as expected. In this context, an important question arises: how can organizations sustain operational resilience when formal systems, particularly ERP systems, are constrained by rigidity and instability?

Recent studies on organizational resilience indicate that operational robustness does not depend only on advanced formal systems, but also on the cognitive and adaptive capabilities of individuals who operate within them. [Hollands et al. \(2024\)](#), based on a mixed-methods study, found that key drivers of resilience are less associated with technical

infrastructure and more closely related to softer organizational capabilities, such as employees' learning orientation and crisis-oriented mindset. Similarly, [Aljuaid \(2025\)](#) showed that employee resilience, coping mechanisms, and supportive human resource practices play an important role in strengthening organizational resilience. In the pharmaceutical industry, [Anand et al. \(2025\)](#) highlighted that operational challenges are becoming increasingly complex and that supply chain quality and robustness are influenced not only by regulatory systems but also by the everyday actions and decisions of practitioners in the field.

Despite the growing body of research on resilience in the pharmaceutical industry, several important gaps remain unresolved. Existing studies have largely emphasized broader organizational and industrial aspects, including supply chain resilience, risk mitigation, and digital transformation. In contrast, the everyday adaptive practices of employees, particularly heuristic workaround behavior in operational routines, have received relatively little academic attention. [Noetzold et al. \(2025\)](#), through their systematic review, indicated that individual adaptive performance has begun to attract greater scholarly interest, yet its relevance remains underexplored in highly regulated industries where strict SOPs limit employees' ability to improvise openly. In ERP-based organizations, studies by [Butarbutar et al. \(2023\)](#) and [Ebirim et al. \(2024\)](#) further suggest that employees often rely on informal adjustments to deal with system limitations. However, these informal practices are rarely positioned as strategic mechanisms that support operational resilience. This overlooked area provides the foundation for the present study.

This study offers novelty by linking operational resilience, cognitive problem-solving, and heuristic workaround behavior within a qualitative-observational analytical framework, situated in the context of the pharmaceutical industry in Sidoarjo, East Java. In contrast to prior studies that mostly rely on quantitative or survey-based approaches, this research uses participatory observation and in-depth interviews to examine how employees develop practical cognitive strategies to sustain operational continuity under the constraints of rigid ERP systems. [Bhosale et al. \(2024\)](#) argued that resilience in the pharmaceutical industry should be understood through a multidimensional perspective, in which human behavior is treated as an active factor rather than a passive component within formal organizational systems. This perspective distinguishes the present study from earlier research and strengthens its academic as well as practical relevance.

Based on the preceding discussion, the research questions are formulated as follows: (1) What forms of heuristic workaround behavior and cognitive problem-solving strategies are used by employees when facing rigid ERP constraints and regulatory inflexibility, particularly SOP and GMP requirements, in the pharmaceutical industry? (2) How does heuristic workaround behavior contribute to the relationship between ERP-related environmental pressure and operational resilience at the work-unit level? (3) What contextual factors support or limit the emergence of cognitive adaptive behavior in a highly regulated pharmaceutical work environment? In line with these research questions, the study pursues three main objectives: (1) to describe and classify the forms of heuristic workaround behavior practiced by employees in responding to the limitations of rigid ERP systems and strict regulatory procedures; (2) to analyze how employees' cognitive adaptive behavior contributes to operational resilience within the organization; and (3) to identify the enabling and constraining factors that shape employees' cognitive adaptive capacity as a basis for managerial policy recommendations ([Zhao, 2024](#)).

Theoretically, this study is expected to enrich organizational resilience literature by spotlighting human agency and cognitive problem-solving capacity as core drivers of operational robustness, particularly in regulated industries. Practically, its findings provide valuable guidance for pharmaceutical management in designing more adaptive policies

that not only enforce formal compliance but also acknowledge and optimize employee cognitive adaptability as a strategic organizational asset (Faggioni et al., 2023).

To deeply understand this operational phenomenon, the study integrates the concepts of human agency, heuristic workaround behaviors, and organizational resilience. Human agency implies that actors do not merely react passively to structural constraints; instead, they exert intentionality, foresight, and self-reactiveness to navigate systemic boundaries (Bandura & Cervone, 2023; Raetze et al., 2021). Within heavily restricted tech environments, this agency manifests as workaround behaviors, where employees utilize practical mental heuristics to bypass rigid system bottlenecks and maintain workflow continuity (Bartelheimer et al., 2023). From a capability perspective, these localized adaptive behaviors serve as the vital micro-foundational routines that allow an organization to anticipate, cope with, and adapt to unexpected disruptions, thereby dynamically scaling up to forge robust operational resilience (Duchek, 2020; Hepfer & Lawrence, 2022).

2. METHODS

This study adopts a mixed-methods approach using an exploratory sequential design. In this design, the qualitative phase is carried out first to obtain an in-depth understanding of heuristic workaround behavior as it occurs in the field. The findings from this phase are then followed by a quantitative phase, which aims to confirm and measure the patterns identified through the qualitative analysis. This design is based on the view that combining qualitative depth with quantitative measurement can provide a more comprehensive understanding of organizational phenomena that are dynamic, complex, and context-dependent (Creswell & Creswell, 2022). The study was conducted in a pharmaceutical company in Sidoarjo, East Java, which operates under strict Good Manufacturing Practice (GMP/CPOB) regulations and uses an ERP system to support its daily operational management.

The qualitative phase was conducted through participant observation and in-depth interviews with employees who were directly engaged in daily operational activities across the warehouse, procurement, and finance divisions. The data were collected through field notes, interview recordings, and documentation of actual work procedures. These data were then analyzed using thematic analysis to identify recurring patterns of cognitive problem-solving and heuristic adaptation that emerged as employees responded to the constraints of a rigid ERP system. The results of this phase generated several core themes, which were later translated into questionnaire items for the quantitative phase in accordance with the logic of an exploratory sequential design (Skamagki et al., 2024).

The quantitative phase was carried out by administering structured questionnaires using a five-point Likert scale. In this phase, a census sampling approach was implemented, encompassing the entire population of operational employees within the target divisions who interact daily with the ERP system, resulting in a total of 101 respondents. The collected data were analyzed using Structural Equation Modeling with the Partial Least Squares approach (PLS-SEM) to examine the relationships among rigid ERP constraints (X), heuristic workaround behavior (Z), and operational resilience (Y). The findings from the qualitative and quantitative phases were then integrated through a joint display, which presents both sets of results in a structured visual format. This integration enabled systematic triangulation and supported the development of more comprehensive meta-inferences.

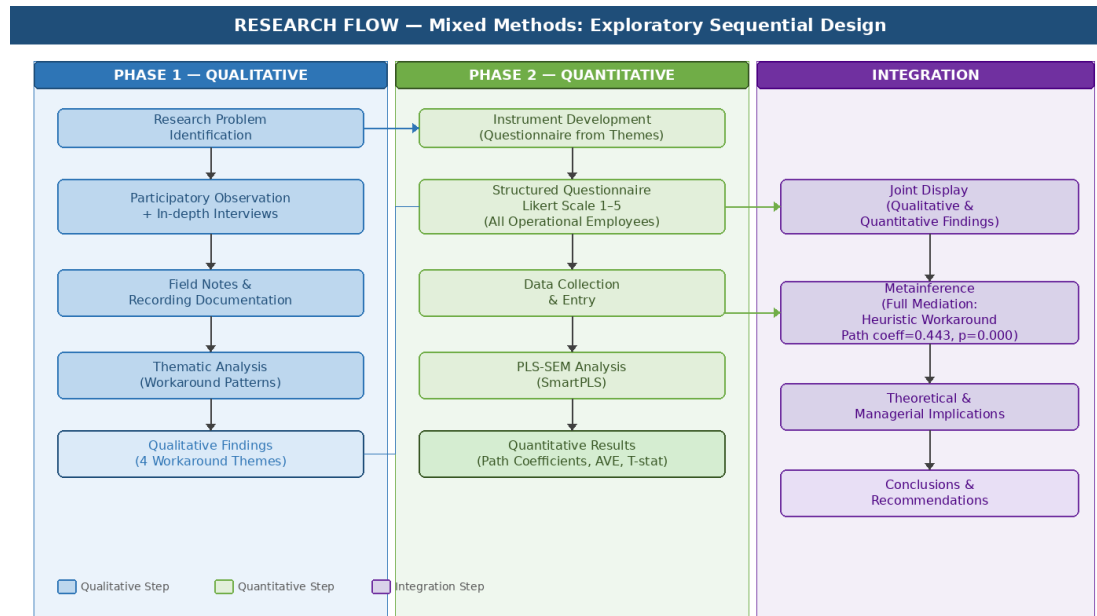


Figure 1. Research Flow (Mixed Methods – Exploratory Sequential Design)

Source: Developed by the researcher, 2026

In the quantitative phase, a census sampling approach was implemented, encompassing the entire population of operational employees within their target divisions who interact daily with their EiRP system. A total of 101 operational employees completed the structured questionnaires. The detailed demographic profile of these respondents is summarized in Table 1a. As shown in Table 1a, the quantitative sample is highly dominated by young professionals, with 59.4% of respondents falling into the 26–35 age cohort. Furthermore, more than half of the respondents (52.5%) possess 1 to 3 years of work experience in the pharmaceutical industry, indicating that their sample is composed of active operational staff who are sufficiently familiar with their daily administrative and system workflows.

Table 1. Demographic Characteristics of Quantitative Respondents (N = 101)

Characteristic	Category	Frequency (n)	Percentage (%)
Age	21–25 years	23	22.8%
	26–35 years	60	59.4%
	36–45 years	15	14.9%
	> 45 years	3	3.0%
Industry Experience	< 1 year	16	15.8%
	1–3 years	53	52.5%
	4–7 years	19	18.8%
	> 7 years	13	12.9%

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 General Overview of Field Findings

This study was carried out at a pharmaceutical company in Sidoarjo, East Java, which operates under Good Manufacturing Practice (GMP/CPOB) regulations and uses an Enterprise Resource Planning (ERP) system to support daily operational activities. Data were collected in two stages: a qualitative stage involving participatory observation and in-depth interviews, followed by a quantitative stage using structured questionnaires. The study identified four forms of heuristic workaround behavior that were repeatedly practiced by employees across several operational divisions. These findings indicate that employees do not merely accept the constraints of formal systems in a passive manner. Instead, they develop alternative work strategies to maintain operational continuity and support their achievement of work targets. This condition reinforces the view that organizational resilience is not shaped only by the sophistication of formal systems, but also by the cognitive and adaptive capacity of the individuals who operate within them.

Table 1. Informant Profile

No	Informant Code	Position	Division	Years of Service
1	INF-01	Senior Staff	Warehouse	7 Years
2	INF-02	Operational Staff	Procurement	4 Years
3	INF-03	Finance Staff	Finance	5 Years
4	INF-04	Supervisor	General Operations	9 Years

Source: Processed by the researcher, 2026

Table 1 provides an overview of the four key informants who participated in the in-depth interview sessions. All informants were active employees directly involved in daily operational activities and therefore possessed relevant tacit knowledge of the workaround practices examined in this study. Their diverse work experiences, ranging from four to nine years, offered valuable insights into how heuristic adaptive behaviors have developed within the organization over time.

3.1.2 In-Depth Interview Results

The in-depth interviews were conducted on February 9, 2026, and produced four main themes related to heuristic workaround behavior. Each theme represents a form of employees' cognitive adaptation in responding to the limitations of a rigid ERP system and the formal regulations applied within their organization. A structured summary of their interview findings is presented in the following Table 2. Based on Table 2, the identified workarounds should not be understood simply as procedural violations. Instead, they reflect employees' pragmatic cognitive responses to the gap between formal system requirements and their operational realities encountered in daily work. These findings indicate that heuristic adaptive behavior emerges organically as a collective coping mechanism, helping employees maintain operational continuity when formal systems are unable to fully accommodate practical work demands.

Table 2. In-Depth Interview Results: Identification of Heuristic Workaround Behavior

No	Interview Question	Informant Response	Workaround Theme
1	What was the reason behind deleting previous-year return data from the ERP system?	"...so that we could distinguish which returns had been fully processed, so the data was deleted from the system... but it remained stored in the office data archive"	ERP Data Management Adaptation
2	What motivated the taking of stock-opname reports in printed hardcopy form?	"...the company's digitalization process is still not running stably, so the safest way to back up data in case of a system error is still through manual recording..."	Manual Backup Adaptation
3	Why are intern incentive payments made in cash rather than through the payroll system?	"...if interns are entered into the payroll system, the process becomes lengthy and inefficient, so it is more practical to record and pay them manually"	Informal Financial Recording Adaptation
4	What is the reason for inputting transactions manually before entering them into the purchase order system?	"...if there are changes in the order list, we have to delete data in each warehouse one by one, because the storage and production locations for each type of medication are different"	Procurement Process Adaptation

Source: Processed by the researcher, 2026

3.1.3 Thematic Analysis Results

The thematic analysis of the four identified workaround practices generated three broader themes that capture the main patterns of employees' cognitive adaptive behavior. Thesei themeis their seirveid as the basis for developing the questionnaire instrument used in the quantitative phase.

Table 3. Results of Thematic Analysis on Patterns of Employees' Cognitive Adaptive Behavior

Theme	Sub-Theme	Behavioral Indicators	Frequency
Digital System Adaptation	ERP data management, manual backup	Old data deletion, daily hard file printing	Very High
Financial Procedure Adaptation	Off-payroll payments, manual recording	Intern cash payment, manual cash book	High
Procurement Process Adaptation	Staged transaction input, PO flexibility	Manual input before system entry, inter-warehouse revision	High

Source: Processed by the researcher, 2026

The three themes presented in Table 3 show that employees' heuristic adaptive behavior in their pharmaceutical company is multidimensional, covering technological, financial, and operational procedure aspects. This finding strengthens the argument that operational resilience in highly regulated environments does not emerge from a single formal mechanism. Rather, it develops through the accumulation of individual adaptive actions that interact with and reinforce one another.

3.1.4 Quantitative Analysis Results (PLS-SEM)

In the quantitative phase, questionnaires were administered to all operational employees. The data obtained from this phase were then analyzed to produce the structural model test results presented in Table 4.

Table 4. Measurement Model Evaluation: Validity and Reliability Statistics

Variable	Indicator	Outer Loading	AVE	Cronbach's Alpha (CA)
Rigid ERP Constraints (X)	X1 – SOP/GMP Rigidity	0.821	0.713	CA: 0.865 / CR: 0.908
	X2 – ERP Limitations	0.798		CA: 0.865 / CR: 0.908
	X3 – Audit Pressure	0.811		CA: 0.865 / CR: 0.908
Heuristic Workaround Behavior (Z)	Z1 – System Workaround	0.843	0.700	CA: 0.852 / CR: 0.901
	Z2 – Financial Adaptation	0.829		CA: 0.852 / CR: 0.901
	Z3 – Procurement Adaptation	0.856		CA: 0.852 / CR: 0.901
Operational Resilience (Y)	Y1 – Operational Continuity	0.877	0.756	CA: 0.893 / CR: 0.925
	Y2 – Target Achievement	0.862		CA: 0.893 / CR: 0.925
	Y3 – System Robustness	0.841		CA: 0.893 / CR: 0.925

Source: Processed by the researcher, 2026

All indicators presented in Table 4 show outer loading values above 0.70 and AVE values above 0.50, indicating that the convergent validity criteria in PLS-SEM analysis have been met. As displayed in Table 4, all reflective indicators exhibited outer loading values well above the minimum threshold of 0.70. For convergent validity, the Average Variance Extracted (AVE) for Rigid ERP Constraints (X), Heuristic Workaround (Z), and Operational Resilience (Y) were 0.713, 0.700, and 0.756, respectively, all exceeding the required 0.50 benchmark. Internal consistency and reliability were verified through Cronbach's Alpha (CA) and Composite Reliability (CR). All constructs demonstrated CA values (X = 0.865, Z = 0.852, Y = 0.893) and CR values (X = 0.908, Z = 0.901, Y = 0.925) well above the 0.70 threshold, indicating satisfactory internal consistency and exceptional measurement model reliability.

Table 5. Hypothesis Testing Results – Path Coefficients and Significance

Hypothesis	Path	Path Coefficient	T-Statistics	P-Value	Decision
H1	X → Z (Rigid ERP Constraints → Heuristic Workaround)	0.612	7.319	0.000	Accepted
H2	Z → Y (Heuristic Workaround → Operational Resilience)	0.724	9.124	0.000	Accepted
H3	X → Y (Direct, without mediation)	0.187	1.942	0.053	Rejected
H4	X → Z → Y (Full Mediation)	0.443	6.160	0.000	Accepted

Source: Processed by the researcher, 2026

The structural model assessment results in Table 5 provide critical insights into the underlying mechanisms of resilience. The direct effect of rigid EIRP constraints on operational resilience (H3) is statistically non-significant ($\beta = 0.187$, $t = 1.942$, $p = 0.053$), exceeding the standard 0.05 significance level. Conversely, the indirect path via workaround behavior (H4) is highly significant ($\beta = 0.443$, $t = 6.160$, $p < 0.001$). Because the direct path becomes non-significant while the indirect path remains exceptionally strong, it is statistically concluded that Heuristic Workaround Behavior acts as a full mediator in the relationship between rigid ERP constraints and organizational operational resilience.

3.2 Discussion

3.2.1 Forms of Heuristic Workaround Behavior in the Regulated Pharmaceutical Environment

Their first research question focused on identifying the specific forms of heuristic workaround behavior practiced by employees within a highly regulated pharmaceutical work environment. The field findings revealed four recurring workaround practices shaped by cognitive problem-solving processes: removing return data from the ERP system to improve the efficiency of tracking completed processes, maintaining hardcopy stock-opname reports as a backup when digital systems fail, providing incentives to interns to address payroll-related inefficiencies, and entering transaction data manually before formal purchase order input to allow greater revision flexibility. These practices were not isolated or incidental actions but had developed into informal work routines that were collectively understood by employees in daily operations (Widiantoro & Shahadan, 2026).

Employees use cognitive heuristics to interpret system limitations and develop alternative work pathways that provide operational flexibility without disregarding core regulatory requirements. This phenomenon is consistent with Mohammad et al. (2024), who found that in highly controlled pharmaceutical environments, organizational culture and informal communication patterns play an important role in maintaining operational continuity beyond formal procedural mechanisms. Employees who possess strong tacit knowledge of their system are also more likely to formulate practical cognitive solutions that are responsive to real operational constraints (Hanu & Khumalo, 2024).

3.2.2 The Mediating Role of Heuristic Workaround Behavior in Shaping Operational Resilience

The second research question examined the mediating role of employee heuristic adaptive behavior in the relationship between rigid ERP constraints and operational resilience. The PLS-SEM results indicate that rigid ERP constraints do not have a significant direct effect on operational resilience. Instead, their effect is fully mediated by employees' cognitive workaround behavior, as shown by a significant mediation path with a path coefficient of 0.443 and a p-value < 0.001 . This finding suggests that rigid system constraints do not automatically lead to resilience. Rather, such constraints act as triggering conditions that encourage employees to engage in cognitive adaptation, and this adaptive response becomes the mechanism through which operational resilience is strengthened.

This finding provides important theoretical implications. Much of the previous literature on organizational resilience has tended to view formal systems as the main source of organizational robustness. However, the present study offers a different perspective by showing that rigid ERP constraints may become obstacles rather than sources of resilience when they are not supported by employees' cognitive adaptive capacity. Aljuaid (2025) similarly, it was found that employee coping mechanisms, including both problem-focused

and emotion-focused coping, explained 45.4% of the variance in organizational resilience. This supports the argument that individual behavior plays a central role in strengthening organizational robustness.

3.2.3 Enabling and Constraining Factors of Cognitive Adaptive Behavior

The third research question explored the contextual factors that support or limit the emergence of cognitive adaptive behavior. Based on the thematic analysis and interview findings, two main groups of factors were identified. The enabling factors include the instability of the company's digitalization system during its transition phase, the pressure to meet daily operational targets that cannot be postponed, and a work culture that permits informal solutions as long as the expected outcomes are achieved. Meanwhile, the constraining factors include the risk of inconsistencies in records that may create audit-related complications, reliance on the tacit knowledge of certain employees that has not been formally documented, and the possibility of conflict with established SOPs if workaround practices are not properly controlled and evaluated ([Widiantoro & Shahadan, 2026](#)).

[Georgeiscu et al. \(2024\)](#) found that psychological capital and a positive work environment can strengthen employees' cognitive adaptive capacity, whereas excessive organizational pressure may weaken it. This finding is consistent with the context of the pharmaceutical company examined in this study, where a supportive work culture and strong informal communication enabled employees to develop practical cognitive workarounds while still remaining attentive to core regulatory requirements. [Agustina et al. \(2025\)](#) further showed that unstable digital transformation increases the need for cultural adaptation and organizational learning as mechanisms for buffering operational disruption. This condition closely reflects the field situation observed in the present study. Overall, the findings support the central argument that operational resilience in a highly regulated pharmaceutical environment is not shaped solely by formal systems. Rather, it emerges from the interaction between rigid ERP constraints, employees' cognitive adaptive creativity, and an organizational culture that recognizes the practical role of controlled workaround practices as part of a collective resilience strategy ([Floreiz-Jimeineiz et al., 2025](#); [Kosycarz et al., 2025](#)).

3.2.4 Risks and Compliance Implications of Workaround Practices

While heuristic workarounds serve as effective operational buffers, their systemic execution raises critical compliance and quality risks within the heavily regulated pharmaceutical framework. The practices identified in this study—such as manual data omission from the ERP database and processing off-system cash transactions—introduce notable documentation inconsistencies. From an industry standpoint, these manual adaptations can severely compromise absolute data integrity and end-to-end audit traceability, which are core requirements under BPOM and international GMP frameworks.

Leaving these workarounds unmonitored creates latent audit risks where minor system adjustments might be flagged as severe compliance breaches. Moreover, the organization becomes highly dependent on the tacit knowledge of specific individual employees, creating operational vulnerability if those staff leave the company. Therefore, rather than dismissing or blindly endorsing these behaviors, pharmaceutical management must critically evaluate, control, and formalize beneficial workaround practices into updated standard corporate procedures to align operational agility with strict regulatory compliance.

4. CONCLUSION

This study shows that operational resilience in the pharmaceutical company in Sidoarjo is not produced merely through formal regulatory compliance. Instead, resilience is shaped through the mediating role of employee heuristic workaround behavior, which reflects rational and pragmatic cognitive responses to the rigidity of Enterprise Resource Planning (ERP) systems and the inflexibility of Standard Operating Procedures and Good Manufacturing Practice requirements. The four identified workaround practices, namely ERP data management adaptation, manual hardfile backup, cash-based intern incentive payment, and pre-system procurement transaction input, should not be interpreted simply as procedural deviations. Rather, they represent forms of collective cognitive adaptation through which employees sustain operational continuity under constrained system conditions.

The PLS-SEM results indicate that rigid ERP constraints have a statistically meaningful effect on operational resilience only when mediated by heuristic workaround behavior, as reflected in the mediation path coefficient of 0.443 with a significance value of $p < 0.001$. This finding reinforces the central role of human agency within the organizational resilience framework. From a managerial perspective, the results suggest that pharmaceutical companies should not rely solely on the enforcement of formal compliance mechanisms. Instead, management needs to recognize, document, evaluate, and optimize effective workaround practices as part of a more adaptive and sustainable resilience strategy. Employees' tacit knowledge should also be transformed into organizational assets through structured knowledge management mechanisms. Future studies are strongly encouraged to expand the research scope to broader regions and explicitly examine the moderating roles of leadership styles, organizational adaptive culture, and institutional digital maturity in shaping employees' cognitive capacity within highly regulated spaces.

5. CONFLICT OF INTEREST

The authors declared that there is no conflict of interest regarding the publication of this manuscript. This research explicitly highlights operational workarounds that organically emerged due to temporary technical limitations and system transition constraints within the organization, conducted purely for academic evaluation.

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7. REFERENCES

- Agustina, E., Nelson, A., & Setyawan, A. (2025). Factors Influencing Organizational Resilience: Mediating Roles of Adaptive Culture and Learning. *JBMP (Jurnal Bisnis, Manajemen dan Perbankan)*, 11(2), 307–328. <https://doi.org/10.21070/jbmp.v11i2.2153>
- Aljuaid, A. A. (2025). Determining organizational resilience through employees' resilient characteristics and supportive HR practices: The moderating effect of managerial resilience. *PLOS ONE*, 20(11 November), 1–16. <https://doi.org/10.1371/journal.pone.0335751>

- Anand, G., Ball, G. P., Gray, J. V., & Mukherjee, U. K. (2025). Operations Management in the Pharmaceutical Industry. *Journal of Operations Management*, 71(3), 302–313. <https://doi.org/10.1002/joom.1365>
- Bandura, A., & Cervonei, D. (Eds.). (2023). *Social Cognitive Theory: An Agentic Perspective on Human Nature*. John Wiley & Sons. <https://doi.org/10.1002/9781394259069>
- Bartelheimer, C., Beverungen, D., & Kundisch, D. (2023). Workarounds as generative mechanisms for bottom-up process innovation: Insights from a multiple case study. *Information Systems Journal*, 33(4), 831–873. <https://doi.org/10.1111/isj.12435>
- Bhosale, K., Baradkar, O., & Lakade, S. (2024). Pharmaceutical Resilience. *Journal of Drug Delivery and Therapeutics*, 14, 191–201. <https://doi.org/10.22270/jddt.v14i12.6907>
- Butarbutar, Z. T., Handayani, P. W., Suryono, R. R., & Wibowo, W. S. (2023). Systematic literature review of Critical success factors on enterprise resource planning post-implementation. *Cogent Business and Management*, 10(3). <https://doi.org/10.1080/23311975.2023.2264001>
- Creswell, J. W., & Creswell, J. D. (2022). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- Ebirim, G., Unigwe, I., Asuzu, O. F., Odonkor, B., Oshioke, E., & Okoli, U. (2024). A Critical Review Of ERP Systems Implementation In Multinational Corporations: Trends, Challenges, and Future Directions. *International Journal of Management & Entrepreneurship Research*, 6, 281–295. <https://doi.org/10.51594/ijmer.v6i2.770>
- Faggioni, F., Valerio Rossi, M., & Sestino, A. (2023). Supply Chain Resilience in the Pharmaceutical Industry: A Qualitative Analysis from Scholarly and Managerial Perspectives. *International Journal of Business and Management*, 18(1), 129. <https://doi.org/10.5539/ijbm.v18n1p129>
- Florez-Jimenez, M. P., Lleo, A., Ruiz-Palomino, P., & Muñoz-Villamizar, A. F. (2025). Corporate sustainability, organizational resilience, and corporate purpose: a review of their academic traditions connecting them. *Review of Managerial Science*, 19(1), 67–104. <https://doi.org/10.1007/s11846-024-00735-3>
- Georgescu, I., Bocean, C. G., Varzaru, A. A., Rotea, C. C., Mangra, M. G., & Mangra, G. I. (2024). Enhancing Organizational Resilience: The Transformative Influence of Strategic Human Resource Management Practices and Organizational Culture. *Sustainability (Switzerland)*, 16(10). <https://doi.org/10.3390/su16104315>
- Hanu, C., & Khumalo, N. (2024). From high-performance work systems and resilience to employee well-being during crises: exploring the moderating role of employee ambidexterity. *Current Psychology*, 43(11), 9955–9968. <https://doi.org/10.1007/s12144-023-05138-3>
- Hepfer, M., & Lawrence, T. B. (2022). The heterogeneity of organizational resilience: Exploring functional, operational, and strategic resilience. *Organization Theory*, 3(1), 1–29. <https://doi.org/10.1177/26317877221074701>
- Hollands, L., Haense, L., & Lin-Hi, N. (2024). The How and Why of Organizational Resilience: A Mixed-Methods Study on Facilitators and Consequences of Organizational Resilience Throughout a Crisis. *Journal of Applied Behavioral Sciences*, 60(3), 449–493. <https://doi.org/10.1177/00218863231165785>
- Khuan, H. (2024). Building Organizational Resilience in the Era of Uncertainty: Strategies and Best Practices. *Management Studies and Business Journal (PRODUCTIVITY)*, 1(2), 1–11.
- Kosycarz, E. A., Juszczak, D., Raulinajtys-Grzybek, M., & Krejner-Nowecka, A. (2025). Implementing resilience-based interventions for healthcare employees' well-being: evidence from the pandemic crisis. *Frontiers in Public Health*, 13(August), 1–14. <https://doi.org/10.3389/fpubh.2025.1606595>
- Mohammad, S., Sagsan, M., & Sesen, H. (2024). The Impact of Learning Organizations on Innovation: The Mediating Role of Employee Resilience and Work Engagement. *SAGE Open*, 14(4), 1–21. <https://doi.org/10.1177/21582440241289185>
- Noetzold, D., Leithardt, V. R. Q., & Barbosa, J. L. V. (2025). Performance monitoring and self-adaptation in smart environments: a systematic literature review. *Telekommunikationssysteme*, 89(1), 13. <https://doi.org/10.1007/s11235-025-01387-8>
- Raetze, S., Duchek, S., Maynard, M. T., & Kirkman, B. L. (2021). Resilience in organizations: An integrative multilevel review and editorial introduction. *Group & Organization Management*, 46(4), 607–656. <https://doi.org/10.1177/10596011211032129>

- Skamagki, G., King, A., Carpenter, C., & Wahlin, C. (2024). The concept of integration in mixed-methods research: a step-by-step guide using an example study in physiotherapy. *Physiotherapy Theory and Practice*, 40(2), 197-204. <https://doi.org/10.1080/09593985.2022.2120375>
- Widiantoro, D., & Shahadan, A. (2026). Adaptasi Alat Ukur Organizational Resilience Pada Karyawan: Versi Bahasa Indonesia. *Psikobuletin Ilmiah Psikologi*, 7(1), 44-56. <https://doi.org/10.24014/pib.v7i1.37960>
- Zhao, Y. (2024). Development of a big data-assisted effective enterprise resource planning framework for smart human resource management. *PLoS ONE*, 19(5 May), 1-28. <https://doi.org/10.1371/journal.pone.0303297>