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DIGITAL CAPABILITY, GREEN INNOVATION, AND INNOVATION PERFORMANCE: THE MEDIATING ROLE OF SUPPLY CHAIN RESILIENCE IN INDONESIAN MANUFACTURING

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Abstract

This study examines the mediating role of supply chain resilience in the relationships between digital capability, green innovation, and innovation performance in Indonesian manufacturing firms. Drawing on a quantitative, cross-sectional research design, data were collected from 342 respondents through a purposive sampling approach and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS 4. The findings reveal that digital capability has no significant direct relationship with innovation performance ($\beta = -0.062$; $p = 0.124$), whereas green innovation ($\beta = 0.378$; $p < 0.001$) and supply chain resilience ($\beta = 0.524$; $p < 0.001$) exhibit positive and significant relationships. Furthermore, supply chain resilience significantly mediates the relationships between digital capability and innovation performance ($\beta = 0.189$; $p < 0.001$) and between green innovation and innovation performance ($\beta = 0.139$; $p < 0.001$). These findings highlight two distinct mediation patterns, indicating that digital capability is associated with innovation performance primarily through supply chain resilience, while green innovation demonstrates both direct and indirect associations. The study contributes to the literature by clarifying the role of supply chain resilience in linking digital and environmental capabilities with innovation outcomes. Practically, the findings emphasize the importance of integrating digital transformation and green innovation initiatives with supply chain resilience strategies to support innovation performance.

Keywords: Digital Capability; Green Innovation; Supply Chain Resilience; Innovation Performance; Manufacturing Industry

INTRODUCTION

Manufacturing firms face simultaneous pressures to digitalize operations, implement environmentally responsible production, and sustain innovation amid supply disruptions. Digital capability (DC) can enable information exchange and coordinated decisions, whereas green innovation (GI) involves environmentally oriented changes in products and processes. Nevertheless, technology adoption and environmental initiatives are not equivalent to innovation performance (IP). Evidence from manufacturing suggests that the value of digital resources often depends on their conversion into collaborative practices and adaptive action (Cheng et al., 2024; Wu et al., 2025). Similarly, green process innovation is associated with benefits that depend on organizational resource orchestration (Appiah et al., 2025).

Innovation projects depend on timely materials, stable production schedules, and coordination among suppliers and customers. Supply chain resilience (SCR), understood as the capacity to anticipate, respond to, adapt to, and recover from disruption, may preserve those conditions. Evidence links digitalization to resilience through integration, visibility, and responsive capabilities (Zhao et al., 2023; Gomes & Silva, 2025; Yu et al., 2025). Other studies associate green innovation with resilience and green logistics management (Issa et al., 2024). These related outcomes do not by themselves establish that either strategic capability is associated with firm-level innovation performance through SCR.

Prior findings differ in their technologies, mediators, and outcome constructs. Jing and Fan (2024) examine supply chain integration and supply chain performance among Chinese listed manufacturers, while Chen et al. (2025) study digital technology innovation, resilience, and enterprise performance among automotive-parts firms. Tian et al. (2024) provide especially pertinent evidence that resilience mediates relationships between datafication and supply chain innovativeness in Chinese manufacturing. Their study narrows the gap that can legitimately be claimed here: mediation between digitalization and innovation-related outcomes is not entirely unexplored. What remains insufficiently addressed in the present setting is the joint comparison of digital capability and green innovation as distinct antecedents of firm-level innovation performance through SCR.

Distinguishing outcomes is therefore essential. Supply chain performance measures logistical efficiency or responsiveness; supply chain innovativeness concerns innovation within supply chain processes; firm-level IP concerns broader product and process innovation results. These constructs should not be treated as interchangeable. A recent study in Batam, Indonesia, links digitalization, integration, and resilience with supply chain performance (Putra & Laulita, 2026), whereas evidence from Denmark connects digitalized manufacturing, SCR, and operational performance (Stentoft et al., 2025). Neither outcome is identical to the IP construct evaluated here. Earlier evidence also relates digital transformation to SCR among manufacturers (Loh & Tan, 2024).

Indonesia offers a pertinent empirical setting because manufacturing firms operate amid differences in technological adoption, environmental practices, supply-network structures, and operational resources. The analysis therefore concentrates on associations among DC, GI, SCR, and IP in respondents representing Indonesian manufacturing businesses. It is not intended to estimate nationally representative population parameters because the original survey used purposive rather than probability sampling.

This study seeks to answer three questions: Are DC and GI directly associated with IP? Is SCR associated with IP? Are the relationships of DC and GI with IP statistically transmitted through SCR? Its proposed contribution is an integrated comparison of the direct

and specific indirect pathways, rather than a claim that digital or green initiatives inevitably cause higher innovation. By contrasting a non-significant direct digital pathway with a significant indirect pathway, the results also offer a more differentiated managerial interpretation of digital capability.

REVIEW OF LITERATURE

Theoretical perspective and conceptual distinctions

Dynamic capabilities theory describes organizational efforts to sense opportunities, seize them, and reconfigure resources as environments change (Teece, 2007). Applied to the present research, DC and GI represent different strategic resources and practices, whereas SCR concerns the ability to preserve and reconfigure supply activities under disruption. The distinction between possessing resources and deploying them is especially important: Wu et al. (2025) find that action-oriented digital technologies mediate the association of resource-oriented technologies with resilience, while Liang et al. (2025) identify configurations of governance and digital capabilities associated with manufacturing resilience. These findings favor a capability-conversion explanation rather than assuming that digital investment automatically produces innovation.

The conceptual framework distinguishes three constructs that are sometimes conflated. First, DC refers to technology-related organizational competence, not the mere ownership of software or machines. Second, GI requires product or process change oriented toward environmental improvement, not simply a general declaration of environmental concern. Third, IP reflects perceived innovative outputs or achievements rather than the volume of digital expenditure or compliance effort. Measurement overlap between GI and IP remains a possible limitation because both concern innovation, and discriminant validity must therefore be explicitly demonstrated.

Studies of digital transformation emphasize intermediate organizational mechanisms. Jing and Fan (2024) examine integration as a pathway to supply chain performance, and Chen et al. (2025) analyze enterprise performance through a supply chain perspective. Zhao et al. (2023) identify multiple mediating routes between supply chain digitalization, resilience, and performance. Using manufacturing panel data, Yu et al. (2025) likewise associate digital transformation with resilience through supply chain integration. A Turkish manufacturing survey also identifies supply chain visibility as a mediating mechanism between digitalization and supply chain performance (Al Tera et al., 2024). These studies justify testing mechanisms but differ from the present model in their independent variables, research settings, or dependent variables.

The digital capability hypothesis does not presume that every digital investment yields immediate innovation. Maycotte et al. (2025) conceptualize digital capabilities as more than isolated technology ownership, while Cheng et al. (2024) link digital capability with green innovation performance through green supply chain collaboration in Chinese manufacturing. A meta-analytic study by Kumar and Raj (2025) finds that big data adoption is related to innovation capability, supply chain integration, and resilience. These findings support a potential digital–innovation association, although they do not establish its direct effect for Indonesian firm-level IP.

H_1. Digital capability is positively associated with innovation performance.

GI can stimulate new product designs, cleaner production processes, materials substitution, and efficiency-oriented learning. Li (2022) associates green innovation with

enterprise performance and green dynamic capability in Chinese manufacturing, while Appiah et al. (2025) show that the value of green process innovation for SME financial performance depends on resource orchestration. Javed et al. (2025) further examine how organizational capabilities and green practices contribute to sustainable environmental performance through innovation. These studies address enterprise, financial, or sustainability performance rather than the precise IP construct used here. GI and IP should therefore be distinguished conceptually and empirically: implementing a green practice is not identical to achieving stronger innovation outcomes.

H_2. Green innovation is positively associated with innovation performance.

SCR may protect collaboration, access to critical inputs, and continuity in the experimentation required for new products and processes. Abourokbah et al. (2023) link absorptive capacity with supply chain innovation performance through agility and resilience. Belhadi et al. (2024) relate artificial-intelligence-driven innovation to resilience and supply chain performance, and Omoush (2025) identifies resilience as a mechanism related to manufacturing performance. More directly, Tian et al. (2024) report a mediating role for resilience in the relationship between datafication and supply chain innovativeness. Such research supports the plausibility of a resilience -innovation connection, although outcome definitions and country contexts remain different. Accordingly, the association between SCR and firm-level IP is tested rather than assumed.

H_3. Supply chain resilience is positively associated with innovation performance.

The mediating role of supply chain resilience

Digital information becomes useful for innovation when it improves supply visibility, exception detection, supplier communication, and operational adaptation. Empirical research reports multiple pathways from digitalization toward resilience through integration (Yu et al., 2025), resource–action combinations (Wu et al., 2025), and agility, adaptability, or alignment (Gomes & Silva, 2025). Evidence from Indonesian manufacturing also points to integration and resilience as complementary mechanisms connecting digitalization with supply chain performance (Putra & Laulita, 2026). Because IP differs from those operational outcomes, this study tests whether SCR statistically mediates the DC–IP relationship.

GI may also support supply continuity through resource efficiency, alternative materials, cleaner processes, and changes in supplier collaboration. Issa et al. (2024) associate GI with SCR through green logistics management, whereas Li (2022) and Appiah et al. (2025) emphasize organizational capabilities that help translate green initiatives into performance. Evidence from China further links digital innovation, SCR, and sustainable performance (Liu et al., 2025). These studies suggest plausible mechanisms but do not prove that SCR transmits an effect from GI to IP in Indonesian firms. The present analysis therefore tests the GI-related direct and indirect associations separately.

H_4. Supply chain resilience mediates the association between digital capability and innovation performance.

H_5. Supply chain resilience mediates the association between green innovation and innovation performance.

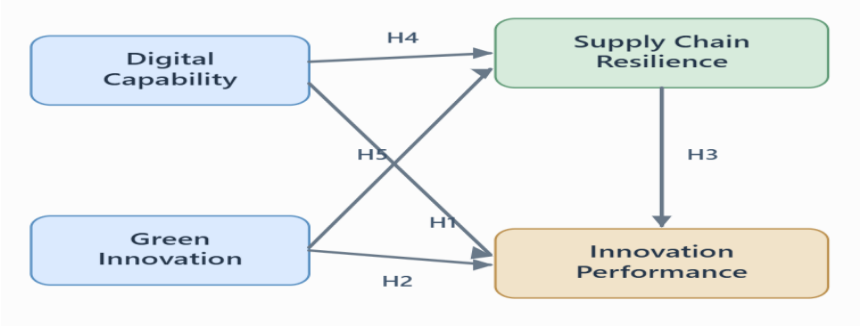


Figure 1. Conceptual Research Framework

Source: Authors' conceptualization based on the literature review

RESEARCH METHOD

Design, data, and sample

This study used a cross-sectional quantitative survey and PLS-SEM to assess the relationships among four latent constructs. The original manuscript reports a target population of 35,134 medium and large manufacturing businesses in Indonesia and a purposively selected sample of 342 survey responses. Eligible businesses were described as engaging in product or process innovation and using digital technology. The questionnaire was distributed online to respondents familiar with business operations and supply-chain activities. The data collection month, geographic coverage, source and year of the population count, response rate, sampling frame, number of unique firms, and procedures for handling potential multiple respondents per company were not documented in the draft and therefore cannot be reconstructed here.

The sample includes general managers (156), directors (127), and business owners (59), as reported in the respondent profile. Most had worked for their organization for seven to ten years (146 respondents). Importantly, the company-size table also includes 25 responses from firms reporting fewer than 20 employees and 102 from firms with 20–99 employees. The source nevertheless classifies every firm as medium or large. This discrepancy requires the authors to verify the operational definition of company size and the corresponding eligibility decisions; no undocumented reclassification or sample exclusion was performed in this revision.

Measures and analytical approach

All indicators used a five-point agreement scale (1 = strongly disagree to 5 = strongly agree). The original instrument comprised eight DC indicators, four GI indicators, five SCR indicators, and five IP indicators. The manuscript describes DC in terms of digital integration, data use, competencies, and technological adaptation (Maycotte et al., 2025); GI in terms of environmentally oriented product and production changes (Issa et al., 2024); SCR in terms of disruption anticipation, response, recovery, and adaptation (Loh & Tan, 2024); and IP in terms of product and process innovation outcomes. Exact item wording, adaptation procedures, and evidence of translation or pilot testing were not supplied in the draft. Therefore, the code-level summaries below should not be treated as a substitute for the original questionnaire.

PLS-SEM can estimate associations among latent constructs when measurement and structural-model assumptions are adequately evaluated (Hair et al., 2019). The method does not, however, resolve limitations of the underlying design. Respondent-level data require

particular care when conclusions concern organizations: the authors should confirm the number of unique firms and whether more than one questionnaire came from any firm. Likewise, statistical mediation in a cross-sectional design cannot establish the temporal sequence required for causal claims (Zhao et al., 2010).

The PLS-SEM analysis was conducted in SmartPLS 4. The reported measurement diagnostics comprise outer loadings, average variance extracted (AVE), Cronbach's alpha, a reported composite-reliability statistic, the heterotrait–monotrait (HTMT) ratios, and the Fornell-Larcker criterion. For the structural model, the draft supplies R^2, Q^2, f^2, direct coefficients, specific indirect coefficients, t statistics, and p values. The hypothesis decisions use two-sided significance at 5% ($t > 1.96$). Consistent with PLS-SEM reporting guidance (Hair et al., 2019), these indices are assessed as complementary evidence; the unreported bootstrap confidence intervals, variance inflation factors (VIFs), and out-of-sample predictive assessment are not fabricated.

RESULTS AND DISCUSSION

Respondent profile and descriptive statistics

Table 1 presents the demographic and organizational characteristics of the 342 respondents. Most respondents were aged 35-44 years (44.2%) and held bachelor's degrees (49.4%). In terms of organizational position, respondents consisted of general managers (45.6%), directors (37.1%), and company owners (17.3%), indicating substantial involvement in managerial and strategic decision-making. Furthermore, more than half of the respondents had at least seven years of work experience, suggesting considerable familiarity with their organizations' operational activities. These characteristics support the relevance of respondents' perceptions in assessing digital capability, green innovation, supply chain resilience, and innovation performance. Nevertheless, the sample characteristics do not establish national representativeness or confirm that each respondent represents a distinct company. Notably, 25 respondents (7.3%) reported working in companies with fewer than 20 employees, raising a potential inconsistency with the study's focus on medium and large manufacturing enterprises. This discrepancy highlights the importance of verifying company-size classifications against the eligibility criteria applied in the study when interpreting the findings.

Table 1. Selected Respondent and Firm Characteristics (n = 342)

Dimension	Categories, n (%)
Gender	Male 185 (54.1); female 157 (45.9)
Age	<25: 10 (2.9); 25–34: 72 (21.1); 35–44: 151 (44.2); 45–54: 94 (27.5); ≥55: 15 (4.4)
Education	High school/vocational 11 (3.2); diploma 70 (20.5); bachelor 169 (49.4); master 83 (24.3); doctorate 9 (2.6)
Position	General manager 156 (45.6); director 127 (37.1); owner 59 (17.3)
Tenure	1–3 years 34 (9.9); 4–6 years 116 (33.9); 7–10 years 146 (42.7); >10 years 46 (13.5)
Employees	<20: 25 (7.3); 20–99: 102 (29.8); 100–249: 142 (41.5); 250–499: 68 (19.9); ≥500: 5 (1.5)

Source: survey data (2026). The reported medium/large classification of all 342 firms requires verification against employee-count categories.

The descriptive means show comparatively high perceived DC (4.32), followed by GI (3.88), SCR (3.76), and IP (3.45). The indicator means range from 4.23 to 4.48 for DC,

3.38 to 4.23 for GI, 3.50 to 3.87 for SCR, and 3.23 to 3.71 for IP. Accordingly, respondents report more favourable assessments of digital-related capability than innovation results. This contrast is descriptive; it is not evidence that digital adoption reduces innovation or that one variable directly determines another.

Table 2. Descriptive Statistics of Study Constructs

Construct	Items	Mean	Item-mean range
Digital capability (DC)	8	4.32	4.23 - 4.48
Green innovation (GI)	4	3.88	3.38 - 4.23
Supply chain resilience (SCR)	5	3.76	3.50 - 3.87
Innovation performance (IP)	5	3.45	3.23 - 3.71

Source: survey data (2026). All item frequencies sum to 342; means are rounded to two decimals.

Measurement-model assessment

Table 3 consolidates the measurement-model results. AVE values range between 0.584 and 0.719, exceeding 0.50 for every construct. Cronbach's alpha varies from 0.759 to 0.922 and the reliability statistic labelled CR in the source ranges from 0.758 to 0.933. Two loadings are below the conventional 0.70 guideline (DC5 = 0.659; GI1 = 0.653). Their retention is defensible only if conceptually important and if removal would not materially improve construct quality; the original model outputs should be reviewed to substantiate this choice (Hair et al., 2019). The source does not clarify whether its CR column reports rho_a or rho_c, so the reliability type also requires confirmation.

Table 3. Convergent Validity and Internal Consistency

Construct	Loading range	AVE	Cronbach α	Reported CR
DC (8 indicators)	0.659 - 0.874	0.646	0.922	0.933
GI (4 indicators)	0.653 - 0.823	0.584	0.759	0.758
SCR (5 indicators)	0.770 - 0.888	0.698	0.891	0.892
IP (5 indicators)	0.801 - 0.892	0.719	0.902	0.910

Source: SmartPLS 4 output (2026). DC5 and GI1 have loadings below 0.70; CR type awaits verification.

HTMT evaluates whether the latent variables are sufficiently distinct (Henseler et al., 2015). All six reported HTMT ratios are below 0.90, with the highest being 0.696 for the IP–SCR pair. The original Fornell–Larcker diagonals were 0.804 (DC), 0.764 (GI), 0.848 (IP), and 0.835 (SCR), each higher than the corresponding interconstruct correlations. The combined evidence is consistent with adequate discriminant validity in the reported sample. Nevertheless, a bootstrap HTMT confidence interval would provide stronger inference if the authors have the SmartPLS output.

Table 4. Heterotrait–Monotrait (HTMT) Ratios

Construct	DC	GI	SCR	IP
DC	—			
GI	0.337	—		
SCR	0.464	0.433	—	
IP	0.315	0.661	0.696	—

Source: SmartPLS 4 output (2026).

Structural model and hypothesis tests

The predictors account for 52.4% of the observed variance in IP (adjusted $R^2 = 0.520$) and 25.2% of the variance in SCR (adjusted $R^2 = 0.248$). The reported Stone-Geisser Q^2 statistics are positive for IP (0.360) and SCR (0.160), supporting the assessment of predictive

relevance within the reported procedure; these are not measures of verified out-of-sample forecasting performance. The effect sizes are especially informative: DC has a negligible unique contribution to IP ($f^2 = 0.006$) but a medium contribution to SCR ($f^2 = 0.161$), whereas SCR has the largest reported contribution to IP ($f^2 = 0.431$). VIF statistics are mentioned in the draft methods, but no numerical outputs are supplied.

Table 5. Explanatory and Effect-size Results

Endogenous construct	R^2	Adjusted R^2	Q^2
IP	0.524	0.520	0.360
SCR	0.252	0.248	0.160

Effect sizes (f^2): DC → IP = 0.006; DC → SCR = 0.161; GI → IP = 0.256; GI → SCR = 0.087; SCR → IP = 0.431. (Source: SmartPLS 4 output (2026).

Table 6 summarizes the five prespecified hypotheses. The direct path from DC to IP is small, negative, and not statistically significant ($\beta = -0.062$; $t = 1.538$; $p = 0.124$); hence H1 is not supported. The negative sign describes the model estimate, not evidence of a harmful digital effect. By contrast, GI is positively associated with IP ($\beta = 0.378$; $t = 9.152$; $p < 0.001$), supporting H2, and SCR shows the largest positive direct association with IP ($\beta = 0.524$; $t = 12.169$; $p < 0.001$), supporting H3.

Table 6. Direct and Specific Indirect Effects

Hypothesis and path	β	t	p	Decision
H1 DC → IP	−0.062	1.538	0.124	Not supported
H2 GI → IP	0.378	9.152	<0.001	Supported
H3 SCR → IP	0.524	12.169	<0.001	Supported
H4 DC → SCR → IP	0.189	6.473	<0.001	Supported
H5 GI → SCR → IP	0.139	5.516	<0.001	Supported

Source: SmartPLS 4 bootstrapping output (2026). β is the reported original-sample coefficient; no confidence intervals supplied.

The results also reveal positive and statistically significant indirect associations between digital capability and innovation performance through supply chain resilience ($\beta = 0.189$; $t = 6.473$; $p < 0.001$), and between green innovation and innovation performance through supply chain resilience ($\beta = 0.139$; $t = 5.516$; $p < 0.001$). These findings support H4 and H5. Values originally displayed as $p = 0.000$ are appropriately reported as $p < 0.001$. However, the absence of reported bootstrap confidence intervals limits the completeness of the mediation evidence (Hair et al., 2019).

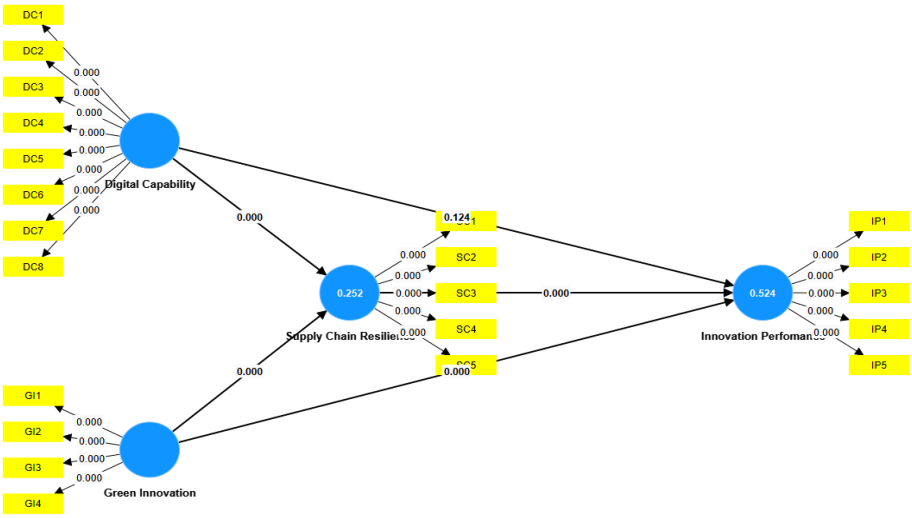


Figure 2. Structural Model Results

Source: Authors' analysis using SmartPLS 4 (2026).

Why does digital capability lack a significant direct association?

The contrast between the high mean of DC (4.32) and its non-significant direct path to IP is the principal empirical insight. A positive self-assessment of technology use does not guarantee that a firm has converted digital resources into new products or effective process innovations. Digital tools may primarily support information accuracy, transaction speed, communication, or operational stability. These benefits are valuable but can lie upstream of the output-based changes measured by IP. The estimated direct coefficient is also close to zero and has a negligible f^2, reinforcing the interpretation that DC adds little unique explanatory information for IP after GI and SCR are accounted for.

The non-significant DC-IP association qualifies, rather than invalidates, previous work. Tian et al. (2024) identify a mediated relationship between datafication and supply chain innovativeness, while Stentoft et al. (2025) find that SCR mediates the relationship between digitalized manufacturing and operational performance. Wu et al. (2025) provide an explanation grounded in the distinct roles of resource-oriented and action-oriented technologies. Together, these studies support the interpretation that technology can be valuable through intermediate capabilities, even when the direct association with a particular innovation outcome is not significant. The present data cannot establish which internal conversion activities produced the indirect estimate.

Green innovation and resilience as complementary routes

Comparison with environmental research requires equally careful construct boundaries. Zhang and Mohammad (2024) study sustainability innovation, resilience, and multidimensional sustainability performance in cold-chain logistics. Li (2022) reports positive associations between GI and enterprise performance among Chinese manufacturers, while Javed et al. (2025) analyze green innovation and environmental performance. Although these findings are broadly consistent with favorable outcomes of GI, none should be described as directly replicating this study's firm-level innovation-performance measure.

The positive GI-IP coefficient is consistent with the view that environmentally oriented changes may become a source of product and process experimentation. Appiah et al. (2025) emphasize resource orchestration as a condition shaping the financial returns to green process innovation, and Cheng et al. (2024) show how digital capability and green

supply chain collaboration relate to green innovation performance. For managers, the implication is to assess whether cleaner production, new materials, and green product development are accompanied by observable innovation results. The current survey establishes association, not the causal effect of adopting particular green technologies.

The comparatively strong SCR-IP association suggests that innovation may benefit from reliable access to materials, adaptable production, and continued collaboration. Tian et al. (2024) offer related evidence for supply chain innovativeness, and Liu et al. (2025) link digital innovation and SCR to sustainable performance. At the same time, Hu and Ma (2026) and Liang et al. (2025) document variation in the ways digitalization and organizational configuration contribute to resilience. Thus, resilience can be discussed as an enabling organizational condition, not a guaranteed universal intervention or a measured causal mechanism in these cross-sectional data.

Interpretation of the two indirect pathways

Interpretation requires attention to the denominators of the comparisons. The coefficients in Table 6 are standardized estimates conditional on the other predictors in the structural model; they do not represent percentage changes in the outcome. Likewise, the fact that SCR has the largest β among the three direct paths does not prove that a practical intervention to improve SCR would deliver the greatest return on investment. Such a conclusion would require intervention data and information about implementation cost. This distinction is important when converting statistical associations into strategic recommendations.

The significant indirect association of digital capability with innovation performance through supply chain resilience, alongside the non-significant direct association, is consistent with an indirect-only mediation pattern in the reported model (Zhao et al., 2010). Digital resources appear to be related to innovation outcomes mainly when accompanied by resilient supply-chain arrangements. This interpretation is compatible with research demonstrating intermediate roles for integration, digitally enabled action, and resilience (Zhao et al., 2023; Wu et al., 2025; Stentoft et al., 2025). Managerially, the result distinguishes investment in digital tools from their deployment in adaptive processes. Because all variables were measured cross-sectionally, the temporal or causal order of these associations cannot be established.

The significant indirect association of GI with IP through SCR, together with GI's significant direct association with IP, is consistent with complementary mediation (Zhao et al., 2010). This pattern suggests that GI may relate to innovation outcomes both through environmentally oriented changes themselves and through the resilience associated with those changes. Findings on green dynamic capabilities (Li, 2022) and green logistics management (Issa et al., 2024) provide plausible complementary explanations, without testing the identical IP outcome. Although the GI indirect coefficient (0.139) is numerically smaller than the digital indirect coefficient (0.189), the difference must not be presented as statistically significant without a formal test. Nor can the estimated coefficients justify uniform causal predictions for all manufacturing firms.

Several alternative mechanisms remain open. A supply network with established integration routines may be more likely to implement both digital systems and innovation projects. Managerial quality, innovation culture, market demand, or access to financial resources could also shape both resilience and innovation performance. Because these potential confounders were not incorporated as reported control variables, a significant

indirect coefficient must not be interpreted as isolating the unique causal channel. The most defensible claim is that SCR statistically accounts for a portion of the association in the fitted model. This boundary condition should remain visible in the abstract, discussion, and final conclusion.

The contribution of the research is thus a distinction between the forms of association rather than a universal ranking of managerial investments. In the surveyed responses, the direct digital association is non-significant, the indirect digital association is positive, and both the direct and indirect green associations are positive. This differentiated pattern informs dynamic-capabilities arguments by suggesting that capability deployment through adaptive supply arrangements may be more informative than the isolated possession of resources. The research extends prior settings with a joint model, while causal mechanisms remain to be confirmed longitudinally.

Managerial implications, boundary conditions, and further research

Managers may distinguish leading resilience indicators, including supplier-data completeness, alternative-source readiness, and recovery-planning capacity, from lagging innovation measures, such as successful product launches and process improvements. This separation follows the conceptual distinction found in studies of digital integration, resilience, and supply chain performance (Kumar & Raj, 2025; Putra & Laulita, 2026). These indicators are suggested applications, not interventions tested in the original survey.

Digital initiatives should be linked with measurable resilience tasks, including shortage alerts, supplier information sharing, recovery decisions, and coordination across production and logistics. Studies of integration, resource–action combinations, and the resilience of digitalized manufacturing suggest why such complementary capabilities matter (Gomes & Silva, 2025; Wu et al., 2025; Stentoft et al., 2025). The findings do not justify an assumption that purchasing digital systems alone will increase innovation results.

Green innovation likewise warrants evaluation in product/process terms and operational terms. Firms may monitor material substitution, energy efficiency, waste reduction, quality, and adaptability. Because research reports different performance consequences and organizational conditions for GI (Li, 2022; Appiah et al., 2025; Javed et al., 2025), resource-allocation decisions should incorporate costs, feasibility, and industrial context. The present survey did not estimate those trade-offs.

The numerical pattern also has implications for how managers define success. A project can install digital dashboards or automate reporting yet fail to shorten development cycles, improve product quality, or generate marketable innovations. Conversely, a digital project that reduces supplier-information delays may show its value first through faster recovery from disruptions. Assessment frameworks should therefore differentiate technology adoption indicators, resilience indicators, and innovation outputs instead of collapsing them into a single performance score.

Three limitations restrict inference. First, purposive sampling, self-reported questionnaires, an unclear unique-firm count, and inconsistent business-size classifications constrain generalizability. Second, the cross-sectional, single-source design may be susceptible to common-method bias and cannot demonstrate causal or time-ordered mediation. Third, several measurement and diagnostic details are unavailable: the full items, indicator-retention justification, bootstrap confidence intervals, the precise reliability coefficient, collinearity results, and independent-sample prediction. Future studies should verify sample eligibility, employ longitudinal or multi-source data, report complete PLS-

SEM diagnostics, and examine differences by subsector, firm size, or environmental uncertainty.

CONCLUSION

This research evaluates digital capability and green innovation as correlates of innovation performance, with supply chain resilience as an intervening construct, using 342 questionnaire responses associated with Indonesian manufacturing firms. Four of five specified hypotheses are supported. DC has no statistically significant direct association with IP, whereas GI and SCR have positive significant direct associations. Both DC and GI have positive significant indirect associations with IP through SCR. The model accounts for 52.4% of the variance in IP and 25.2% in SCR.

The central implication is that digital capability should not be equated with innovation achievement without considering how it is operationalized. For the surveyed sample, resilient supply-chain arrangements are a plausible statistical link between digital initiatives and innovation performance, while GI is associated with innovation performance through both direct and mediated paths. These are associations, not proof of causal mediation. Before submission, the authors should reconcile the firm-size eligibility discrepancy and provide missing sampling and SmartPLS diagnostics; doing so is essential to the credibility of the empirical contribution.

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