Turning Data into Value: A Conceptual Model of BDAC Across Operations, Marketing, and Finance

Abstract

Big data analytics (BDA) is increasingly positioned as a strategic resource for improving firm performance, yet performance effects remain heterogeneous across organizations. Prior research indicates that value does not emerge from data or technology alone; instead, firms must develop a big data analytics capability (BDAC) that integrates data assets, technology infrastructure, analytical talent, governance, and an analytics-driven culture into decision-making routines. Building on the resource-based view and dynamic capabilities logic, this paper develops a conceptual model explaining how BDAC enhances operational performance (efficiency, quality, flexibility) and marketing performance (acquisition, retention, customer value), and how these improvements translate into financial performance (profitability, growth, returns). The framework proposes that operational and marketing performance act as complementary mediators of BDAC's financial impact, while strategic alignment, governance maturity, and environmental dynamism condition the strength of these relationships. The paper offers testable propositions, construct definitions, and measurement guidance to support empirical validation and to inform managerial implementation.

Keywords: big data analytics; analytics capability; operational performance; marketing performance; financial performance; dynamic capabilities; conceptual framework

1. Introduction

Modern organizations are adopting data-driven decision-making amid mounting uncertainty, shifting customer demands, and increasingly complex operations. Despite the potential of big data and analytics to enhance forecasting accuracy, accelerate decision-making, and refine customer strategies, evidence indicates that analytics investments often underperform when implemented as standalone technological solutions (Davenport & Harris, 2007; LaValle et al., 2011; Bteibt et al., 2024). Analytics delivers real strategic impact only when woven into the fabric of organizational practices and reinforced by essential complementary assets—including talented teams, robust data governance frameworks, and systematic knowledge management (Wamba et al., 2017; Ferraris et al., 2019; Zhang & Thurasamy, 2024).

Drawing on resource-based view (RBV) and dynamic capabilities frameworks, researchers emphasize that companies must cultivate comprehensive big data analytics capabilities (BDAC)—combining technological infrastructure, analytical expertise, management systems, and organizational culture—to reliably convert data-driven insights into measurable performance gains (Wamba et al., 2017). However, these capabilities alone don't guarantee success. Rather,

they generate value indirectly by strengthening dynamic capabilities: the organizational routines that enable firms to identify opportunities, respond to environmental shifts, and reallocate resources strategically (Teece et al., 1997; Wamba et al., 2017; Panda, 2025). Research further demonstrates that knowledge management practices serve as multipliers, enhancing how organizations create and apply analytical insights within their decision-making frameworks (Ferraris et al., 2019).

Consequently, successful analytics implementation extends far beyond technology deployment—it requires constructing a holistic organizational ecosystem encompassing talent, processes, governance structures, and cultural norms that embed analytical insights into both routine operations and strategic initiatives.

This conceptual article explores three core questions:

- **RQ1:** What are the pathways through which BDAC enhances operational and marketing performance?
- **RQ2:** In what ways do operational and marketing performance function as intermediaries between BDAC and financial outcomes?
- **RQ3:** What contextual factors amplify or diminish these relationships?

The article advances a comprehensive framework positioning process optimization (operations) and customer value generation (marketing) as dual, mutually reinforcing routes to financial success, while offering empirically testable propositions and measurement recommendations for future research.

2. Literature Background

2.1. Resource-Based View and Complementary Assets

The resource-based view (RBV) explains performance differences by emphasizing valuable, difficult-to-imitate resources and capabilities (Bharadwaj, 2000; Hsiao, 2024). In analytics contexts, data and generic tools are increasingly accessible; therefore, competitive advantage is more likely to stem from capability bundles that combine data, technology, skills, and embedded routines. Accordingly, BDAC is conceptualized as a higher-order capability rather than a single IT investment (Madhala & Helander,2024). This view is consistent with RBV-informed research on information technology capability and IT business value, which emphasizes complementary assets and organizational embedding as prerequisites for performance gains (Bharadwaj, 2000; Melville et al., 2004).

2.2. Dynamic Capabilities and Environmental Fit

Dynamic capabilities theory identifies three essential mechanisms through which organizations maintain competitive relevance: perceiving environmental shifts and emerging trends (sensing), executing strategic responses with appropriate timing (seizing), and restructuring organizational configurations to sustain fit with new realities (reconfiguring) (Teece, Peteraf, & Leih, 2016; Ooi et al.,2026). Analytics-driven capabilities transform each mechanism—they augment firms' capacity to detect subtle patterns and anticipate disruptions (sensing), support rigorous scenario analysis and rapid prototyping (seizing), and enable adaptive learning through continuous process optimization (reconfiguring) (Madhala, Li, & Helander, 2024; Hsiao, 2024). This theoretical lens suggests that the value generated by Big Data Analytics Capabilities (BDAC) escalates proportionally with the degree of environmental turbulence and competitive flux organizations face (Chatterjee, Rana, & Dwivedi, 2021; De Rijck, 2022).

2.3. Information Systems Success and Net Benefits

Research in information systems indicates that organizational benefits depend on system quality, information quality, user adoption, and sustained use, as outlined in the well-known IS success model (DeLone & McLean, 2003; Krisdianto et al., 2026). From this viewpoint, governance, data quality, and trust are vital to the value of analytics because, without dependable, high-quality data, users are less inclined to adopt or trust analytical results, which can hinder performance improvements (Dehghan et al., 2026). Recent studies suggest that organizations with mature data governance programs experience better data quality, improved analytics outcomes, enhanced collaboration, and quicker access to relevant data (Etikala, 2025; Leghemo et al., 2025; Ziezo & Hweka, 2025; Dehghan et al., 2026). Systematic reviews and empirical research confirm that data quality is crucial for effective decision-making and sustained IT performance, with analytics-driven governance frameworks enabling more accurate, timely, and trustworthy decisions (Wamba et al., 2017; Firdaus et al., 2025; Hussinki et al., 2025). These insights emphasize that integrating strong governance, high-quality data, and user trust is essential to turning analytic capabilities into tangible organizational value, such as better decision-making, increased adoption, and strategic success (Etikala, 2025; Hussinki et al., 2025).

2.4. Literature Review Synthesis

Table 1 summarizes key research streams and their implications for the proposed framework.

Theme	Representative studies	Key constructs	Implications for this paper
RBV and capability bundles	Barney (1991); Gupta & George (2016)	Resources: higher-order capability (BDAC)	Treat analytics as a capability system (data, tech, talent, governance, culture) rather than a tool purchase.

Dynamic capabilities	Teece et al. (1997); Eisenhardt & Martin (2000)	Sensing; seizing; reconfiguring; agility	Explain why analytics becomes more valuable under change; motivates environmental dynamism as a moderator.
IS success and value realization	DeLone & McLean (2003).	Information quality; use; net benefits	Justifies the importance of data quality, governance, and adoption to achieve measurable benefits.
Operations and supply chain analytics	Gunasekaran et al. (2017).	Assimilation; process optimization; resilience	Supports BDAC → operational performance via visibility, prediction, and optimization mechanisms.
Marketing analytics and customer value	Wedel & Kannan (2016); Erevelles et al. (2016)	Segmentation; personalization; experimentation; CLV	Supports BDAC → marketing performance via insight extraction, personalization, and improved measurement.
Marketing capabilities and financial outcomes	Vorhies & Morgan (2005). Morgan et al. (2009); Rust et al. (2004)	Marketing capabilities; customer equity	Motivates marketing performance → financial performance and the translation of marketing outcomes into economic value.

Table 1. Literature review synthesis (conceptual).

3. Construct Definitions

3.1. Big Data Analytics Capability (BDAC)

BDAC reflects an organization's capacity to systematically collect, integrate, interpret, and use data-driven insights in decision-making and operational routines at scale (Bteibt et al., 2024; Nguyen et al., 2026). Consistent with established literature, BDAC is conceptualized as a multidimensional, higher-order capability comprising several interconnected components: the quality and accessibility of data assets, a robust technological infrastructure, skilled analytical personnel capable of translating insights into actionable strategies, comprehensive governance frameworks and risk management protocols, and an organizational culture that emphasizes analytics-informed decision-making embedded throughout organizational processes (Zhang & Thurasamy, 2024; Wu et al., 2024; Fosso Wamba et al., 2024; Ziezo & Hweka, 2025).

3.2. Operational Performance

Operational performance represents the degree to which an organization's internal processes effectively and efficiently transform resources into valued outputs while meeting customer requirements. It is commonly assessed through metrics including productivity levels, cost effectiveness, process cycle times, output quality, system reliability, and adaptive flexibility (Narasimhan & Das, 2001; Peng et al., 2011). These indicators encompass both standard operational results and the organization's capacity to adjust and respond to environmental shifts (Peng et al., 2011; Sitepu et al., 2025). Superior operational performance strengthens competitive dimensions such as delivery speed, product quality, and cost management, which collectively enhance customer satisfaction and overall organizational effectiveness (Narasimhan & Das, 2001; Sylva, 2020). When firms embed analytics and performance tracking within operational workflows, they gain the ability to pinpoint inefficiencies, optimize resource allocation, and increase agility, rendering performance outcomes both visible and actionable (Sitepu et al., 2025). Consequently, operational performance serves as both a foundation for day-to-day execution and a critical strategic capability in contemporary organizational contexts.

3.3. Marketing Performance

Marketing performance reflects how effectively an organization’s market-facing activities achieve desired outcomes and contribute to strategic goals, and it is commonly evaluated using metrics that capture *customer acquisition and conversion, customer retention and churn reduction, customer lifetime value, and the effectiveness of marketing campaigns* (Farris et al., 2010; Saura et al., 2017). Customer acquisition metrics—such as conversion rate and customer acquisition cost—show how well marketing efforts attract and convert prospects into customers, while retention and churn metrics measure the organization’s ability to sustain ongoing relationships and minimize customer loss (Farris et al., 2010; Goswami, D., & Rainy,2025). Customer lifetime value (CLV) estimates the total value a customer contributes over the duration of their relationship, linking long-term revenue potential to marketing effectiveness (Deb et al.,2026). Campaign effectiveness metrics, including conversion tracking and ROI indicators, help firms assess how different marketing actions perform relative to objectives and budget, informing resource allocation and optimization (Saura et al., 2017). Together, these measures provide a comprehensive view of marketing’s contribution to business performance in both the short and long term.

3.4. Financial Performance

Financial performance reflects an organization’s economic outcomes and its ability to create value and maintain growth over time (Molina-Azorín et al.,2009). It is often measured by indicators such as profitability, profit margins, revenue growth, returns on investment or assets (e.g., ROI, ROA), and cash flow, which collectively show how well a firm uses its resources to

generate economic value and meet stakeholder expectations (Molina-Azorín et al.,2009; Vintilă, 2025; Mičieta et al., 2025). These financial results are typically downstream indicators, meaning they often follow improvements in operational and marketing performance and may exhibit delays before fully affecting financial outcomes (Vintilă, 2025). Such measures are vital for assessing the economic impact of strategic decisions, capital allocation, and overall business sustainability, giving managers and investors insight into both short-term performance and long-term financial health (Ali et al., 2020; Vintilă, 2025; Mičieta et al., 2025).

4. Conceptual Framework and Propositions

The proposed conceptual framework shows how Big Data Analytics Capability (BDAC) adds value through two main pathways: process value creation, reflected in operational performance, and customer value creation, reflected in marketing performance. Both pathways are expected to contribute positively to financial performance, with possible complementary effects, meaning improvements in operations and marketing may together boost economic results beyond their separate impacts. Figure 1 depicts the conceptual model, emphasizing the mediating role of operational and marketing performance and potential moderators that affect the strength of these relationships.

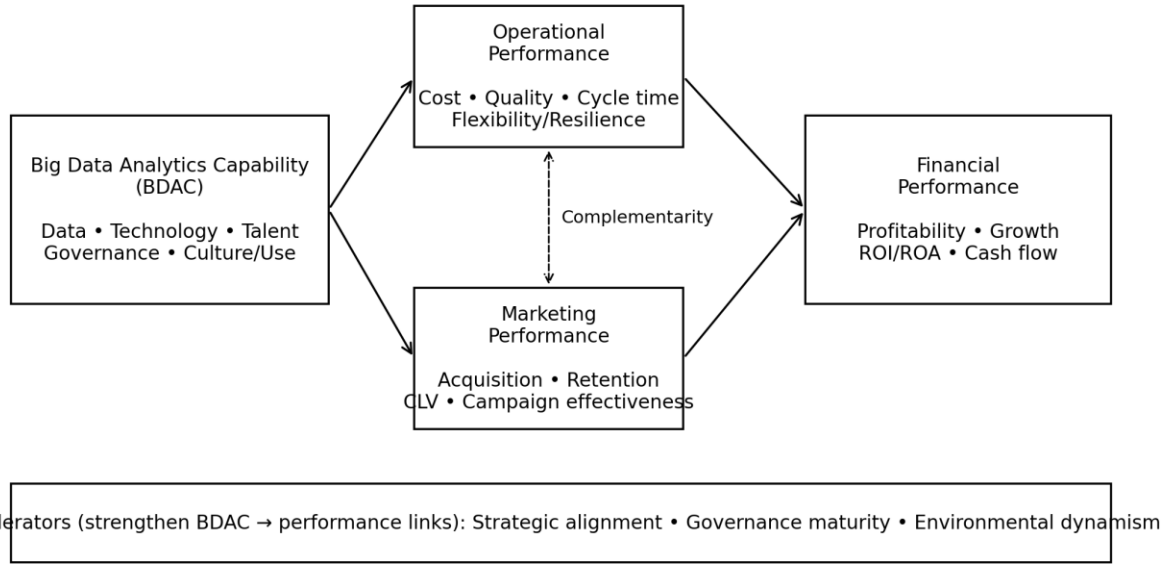

Figure 1. Conceptual model linking BDAC to operational, marketing, and financial performance with mediators and moderators.

4.1. BDAC and Operational Performance

Big Data Analytics Capability (BDAC) boosts operational performance by increasing process visibility, enabling predictive insights, and supporting workflow optimization. Integrating data across the value chain enhances coordination, reduces silos, and supports data-driven decisions (Zhan & Tan, 2020; Hallikas et al., 2021; Benzidia et al., 2023). Studies show organizations with strong BDAC achieve higher efficiency, faster responses, and better collaboration through real-time analytics and integrated data (Balci & Ali, 2024; Ravikumar, 2025). Predictive analytics helps anticipate demand shifts, failures, and delays, enabling proactive measures to improve reliability and efficiency. BDAC also enables process automation, thereby reducing cycle times, optimizing resource utilization, and lowering costs. These improvements lead to better financial outcomes and operational success (Akter et al., 2016; Wamba et al., 2017).

P1: Big Data Analytics Capability (BDAC) positively influences operational performance by enhancing process visibility, predictive decision-making, and workflow optimization across the value chain.

4.2. BDAC and Marketing Performance

BDAC improves marketing performance by generating deeper customer insights, enabling precise segmentation, and supporting scalable personalization, thereby increasing relevance and engagement in marketing activities (Sun, 2024; Xiao et al., 2024). It also facilitates next-best-action decisions and better experimentation with campaign variations, strengthening budget allocation and improving attribution of outcomes to specific tactics (Haider et al., 2024). These data-driven capabilities help firms attract new customers, retain existing ones, and grow customer equity by delivering value across touchpoints (Akter et al., 2023). By aligning analytical insights with marketing execution, BDAC enhances the effectiveness of customer acquisition and retention strategies while improving responsiveness to market changes (Haverila & Haverila, 2024). This perspective is consistent with foundational research on marketing strategy, which shows that superior marketing capabilities and market-based assets translate into stronger customer outcomes and competitive advantage (Day, 1994; Srivastava et al., 1998). In this way, BDAC strengthens both short-term performance and long-term customer relationships, contributing to overall firm success.

P2: Big Data Analytics Capability (BDAC) enhances marketing performance by facilitating more profound customer insights, efficient segmentation and personalization, as well as

improved experimentation and attribution. This progression ultimately leads to increased campaign effectiveness and customer equity.

4.3. Operational and Marketing Performance as Drivers of Financial Performance

Operational and marketing performance are key drivers of financial performance because improvements in internal efficiency and customer outcomes ultimately translate into stronger economic outcomes. Operational improvements—such as reduced costs, higher asset utilization, shorter cycle times, and improved reliability—enhance profitability and cash flow by lowering expenses and more effectively leveraging existing resources (LEE, 2019; Siraj, 2025). Marketing improvements drive revenue growth, strengthen unit economics by lowering customer acquisition costs and increasing customer lifetime value (CLV), and build customer equity that supports sustainable demand (Kumar & Pansari, 2016; Lemon & Verhoef, 2016). Because financial outcomes are downstream and may lag operational and marketing gains, BDAC is expected to influence financial performance largely through these intermediate pathways (Mičieta et al., 2025; Vintilă, 2025). Together, operational and marketing gains provide a comprehensive mechanism linking data-driven capabilities to economic performance.

P3: Operational performance mediates the relationship between big data analytics capabilities (BDAC) and financial performance, such that firms with stronger BDAC achieve superior financial outcomes through improvements in cost efficiency, asset utilization, cycle time reduction, and operational reliability.

P4: Marketing performance mediates the relationship between big data analytics capabilities (BDAC) and financial performance, such that firms with stronger BDAC achieve superior financial outcomes through enhanced revenue growth, improved customer acquisition efficiency, increased customer lifetime value, and strengthened customer equity.

4.4. Mediation and Complementarity

The relationship between BDAC and financial performance is primarily indirect, mediated by operational and marketing performance. Operational success entails improved process efficiency, reliability, and cost savings, whereas marketing success entails increased customer acquisition, retention, and lifetime customer value (LEE, 2019; Kumar & Pansari, 2016; Siraj, 2025). These metrics are more closely tied to managerial decision-making, whereas financial outcomes are downstream and may lag due to aggregation and competitive dynamics (Mičieta et al., 2025; Vintilă, 2025). Complementarity arises because marketing actions influence operational demand, and operational reliability enhances customer retention and marketing effectiveness (Wamba et al., 2017).

P5: Operational performance mediates the relationship between BDAC and financial performance, transmitting the effects of analytics on process efficiency and reliability into economic outcomes.

P6: Marketing performance mediates the relationship between BDAC and financial performance, translating data-driven customer insights and marketing effectiveness into revenue growth and customer equity.

P7: Operational and marketing performance jointly reinforce financial performance, such that their combined effect on financial outcomes is greater than the sum of their individual contributions.

4.5. Boundary Conditions (Moderators)

Boundary conditions determine when and under what circumstances BDAC most effectively improves operational and marketing performance. Strategic alignment ensures that analytics initiatives focus on high-impact decisions, clarify decision rights, and prioritize resources, enhancing the effect of BDAC on performance (Chen et al., 2012). Governance maturity—including data quality management, compliance, and standardized processes—builds trust in analytics outputs and encourages adoption, strengthening BDAC's impact (Wamba et al., 2017). Environmental dynamism, characterized by rapid changes in market conditions or technology, increases the value of timely insights, enabling firms with strong BDAC to sense opportunities and adapt more quickly (Akter et al., 2023; Rainy et al.,2024). Together, these moderators shape the effectiveness of BDAC by enhancing or constraining its influence on operational efficiency and customer outcomes.

P8: The positive relationship between BDAC and performance is contingent upon strategic alignment, whereby firms that prioritize analytics for high-impact decisions, establish clear decision rights, and allocate resources systematically realize greater performance gains from their analytics capabilities than firms with lower strategic alignment.

P9: The positive relationship between BDAC and performance is contingent upon governance maturity, whereby firms with established data quality controls, compliance mechanisms, and standardized analytical processes experience stronger performance improvements from BDAC due to increased trust and organizational adoption of analytics outputs.

P10: The positive relationship between BDAC and performance is contingent upon environmental dynamism, whereby firms operating in rapidly changing markets or technology

landscapes derive greater value from BDAC through enhanced ability to detect emerging opportunities and execute timely adaptive responses.

4.6. Summary of Hypothesis

Table 2 summarizes the hypotheses proposed by the conceptual framework.

Hypothesis	Proposed relationship	Rationale (mechanism)
H1	BDAC → Operational performance (+)	Visibility, prediction, optimization, and workflow embedding improve efficiency and reliability.
H2	BDAC → Marketing performance (+)	Segmentation, personalization, experimentation, and measurement improve customer outcomes.
H3	Operational performance → Financial performance (+)	Cost reduction, asset utilization, and service level improvements enhance profitability and cash flow.
H4	Marketing performance → Financial performance (+)	Revenue growth and customer equity (CLV) improve profitability and returns.
H5	BDAC → Financial performance (indirect via operations)	Operational improvements mediate the financial effect of analytics adoption.
H6	BDAC → Financial performance (indirect via marketing)	Marketing improvements mediate the financial effect of analytics adoption.
H7	Operations × Marketing → Financial performance (+)	Complementarity: service reliability supports retention; demand intelligence supports operations.
H8	Alignment moderates BDAC → performance	Alignment prioritizes high-impact use-cases and clarifies decision rights.
H9	Governance moderates BDAC → performance	Governance increases trust, compliance, and sustained use.
H10	Dynamism moderates BDAC → performance	Analytics is more valuable in uncertain, rapidly changing environments.

Table 2. Hypotheses summary.

5. Implementation Logic and Evaluation

Although the framework is conceptual, it implies a staged implementation and value logic. Organizations typically move from diagnosing readiness and high-value use cases to capability building, to deploying workflows, and finally to measurement and scaling. Figure 2 presents a

structured implementation view that is consistent with iterative (agile) delivery and value-focused (lean) prioritization.

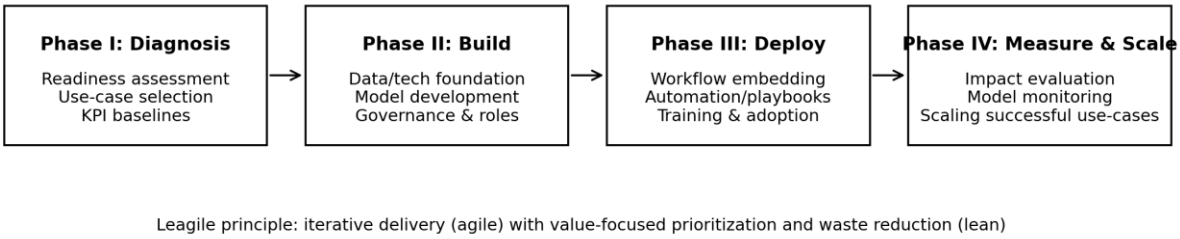

Figure 2. Implementation phases for converting analytics capability into measurable performance outcomes.

5.1. Suggested Measures (KPIs) for Empirical Validation

Table 3 proposes example indicators that can be adapted to the industry context. Researchers should, where possible, combine perceptual measures (e.g., survey scales) of BDAC and adoption with objective or archival measures of performance. A multi-dimensional KPI approach is also consistent with balanced scorecard logic, which encourages linking operational and customer outcomes to financial results (Kaplan & Norton, 1992).

Construct	Example indicators	Notes
BDAC	Data integration/quality; scalable infrastructure; analytics talent; governance maturity; analytics use in decisions	Typically measured via validated multi-item survey scales; can be modeled as a higher-order construct.
Operational performance	Cycle time; defect rate; downtime; forecast accuracy; on-time delivery; inventory turns; cost-to-serve	Prefer objective measures; if survey-based, use items relative to competitors to reduce industry noise.
Marketing performance	Conversion rate; CAC; retention/churn; CLV; campaign lift; attribution-based ROI	Experiments and uplift modeling can strengthen causal interpretation of marketing impacts.
Financial performance	Operating margin; ROA/ROI; revenue growth; cash flow; profit per segment	Use time-lags to capture delayed financial effects of operational and marketing improvements.
Moderators	Strategic alignment; governance maturity; environmental dynamism	Test via interaction terms; environmental dynamism can be measured by perceived volatility or industry indicators.

Table 3. Example measures for BDAC, operational performance, marketing performance, and financial performance.

6. Discussion and Implications

6.1. Theoretical Implications

First, the framework explains why analytics returns vary: value depends on a complementary capability system and on adoption within operational and marketing routines. Second, the model highlights mediation through decision-proximal outcomes (operational and marketing performance), which helps clarify why financial effects may be delayed. Third, adding moderators (alignment, governance, dynamism) provides testable boundary conditions that can reconcile mixed empirical results.

6.2. Managerial Implications

For practitioners, the framework stresses that analytics programs should focus on action, not just insight. Investments in data pipelines and tools need to be balanced with investments in governance, training, and workflow integration. Managers can boost accountability by linking analytics use cases to specific operational and marketing KPIs, then tracking these KPIs to financial results using time-lagged measurement and benefit analysis.

7. Conclusion

This paper presents a conceptual framework where BDAC influences firm performance through two interconnected pathways: operational performance (process value creation) and marketing performance (customer value creation). These pathways mediate BDAC's impact on financial performance and are enhanced by strategic alignment, governance maturity, and environmental dynamism. Future research can test the model using time-lagged designs, structural equation modeling, and mixed-method or configurational approaches to explore different capability setups.

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