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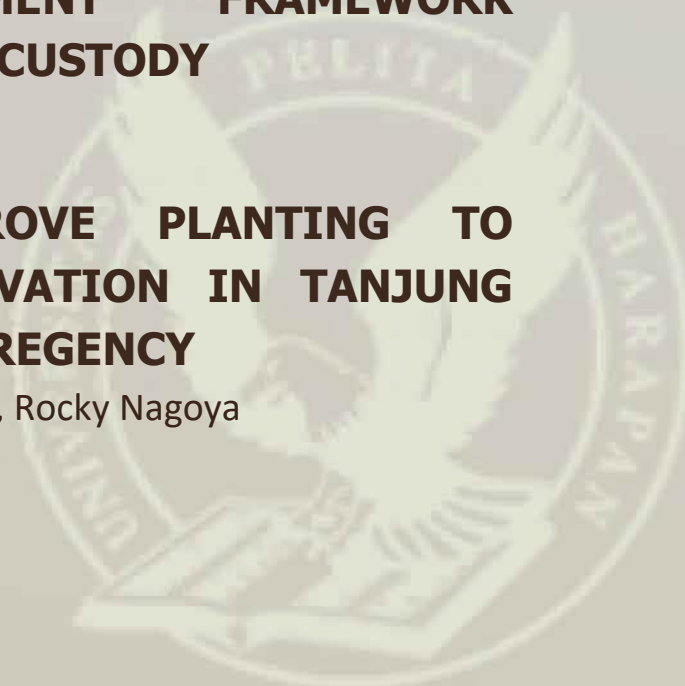
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ESG AND ARTIFICIAL INTELLIGENCE INTEGRATION IN DIGITAL BANKING TRANSFORMATION: A QUALITATIVE CASE STUDY OF BANK RAKYAT INDONESIA

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ABSTRACT

Sustainability commitments and technological capabilities are increasingly expected to be integrated into a coherent strategic configuration rather than managed as parallel initiatives, particularly within digitally transforming financial institutions, yet limited evidence explains how this occurs in state-owned banks in emerging markets. This study examines how Bank Rakyat Indonesia (BRI), Indonesia's largest state-owned bank, appears to integrate Environmental, Social, and Governance (ESG) principles with Artificial Intelligence (AI) capabilities within its digital transformation strategy. Using a qualitative single case study design, the study analyses 47 secondary documents — annual reports, sustainability reports, and regulatory publications issued between 2021 and 2023 — through content and thematic analysis guided by the Resource-Based View, Dynamic Capabilities Theory, and Institutional Theory. Because the analysis relies entirely on corporate and regulatory disclosures, the findings are presented as interpretations of these public narratives rather than verified organizational facts. Four interconnected themes emerge: AI-driven data infrastructure strengthens ESG governance through monitoring and reporting; AI-assisted credit assessment for micro, small, and medium enterprises links ESG social objectives with AI implementation; BRI's proprietary AI ecosystem appears to generate competitive advantage through cumulative data assets and network effects; and ESG–AI narratives function as a legitimacy strategy toward regulators, investors, and development institutions. The study proposes the ESG–AI Strategic Convergence Model (EASCM), suggesting that competitive advantage may emerge when ESG and AI capabilities are co-designed as mutually reinforcing resources. The single-case, document-based design limits generalizability; future research should verify these propositions using primary data and cross-case comparison.

Keywords: ESG–AI Integration; Digital Banking Transformation; Financial Inclusion; Sustainable Competitive Advantage; State-Owned Banks

INTRODUCTION

The banking sector is increasingly shaped by the convergence of ESG commitments and AI-driven digital transformation. Integrating ESG principles with AI capabilities has become strategically important for improving governance, sustainability performance, and long-term competitive advantage. Banks that manage ESG and AI separately risk fragmented governance and inefficient strategic investment. Conversely, integrating both capabilities may strengthen operational efficiency, sustainability performance, and institutional legitimacy.

BRI represents a relevant case because of its strong MSME orientation, state-owned institutional mandate, and publicly documented ESG and AI transformation initiatives. Existing scholarship has, in the main, approached ESG and AI as distinct research domains. The ESG literature has concentrated on sustainability performance, stakeholder governance, and the risk management implications of non-financial disclosure. Research on AI in banking has largely emphasized technological efficiency, predictive analytics, and innovation-driven performance gains. While both bodies of work have generated important insights, their evolution in relative isolation has produced a significant conceptual gap: there is no established framework for understanding how ESG principles and AI capabilities interact as strategically complementary and co-evolving elements. This gap is sharpest in the context of state-owned banks in emerging markets, where the institutional conditions that shape both sustainability strategy and technological investment are markedly different from those that characterize private commercial banks in developed economies.

Three specific research gaps motivate the present study. First, although the strategic management literature has recognized that digital transformation fundamentally reshapes the resource and capability configurations through which banks compete, the possibility that ESG commitments might function as a constitutive design principle rather than an external constraint for AI system development has not been systematically explored (Ellström et al., 2022; Bhandari et al., 2022). Second, the institutional conditions specific to state-owned banks in emerging-market settings have been largely absent from ESG–AI research, despite the developmental significance and institutional distinctiveness of such institutions. Third, and most fundamentally, the literature reviewed for this study offers no integrative conceptual framework explaining how ESG and AI generate competitive advantages and institutional legitimacy in ways that neither capability achieves independently — a gap this study seeks to address through the ESG–AI Strategic Convergence Model (EASCM). BRI is selected because its scale, MSME mandate, and public ESG–AI disclosures make these dynamics unusually visible, though the single-case design means the empirical contribution lies primarily in the conceptual model proposed rather than in claims of generalizability across banks.

Although previous studies have separately examined ESG implementation and AI adoption in banking institutions, limited research has explored how both capabilities strategically converge within state-owned banks in emerging markets. Existing studies also rarely explain how ESG and AI integration contributes simultaneously to competitive advantage, institutional legitimacy, and digital financial inclusion. This study addresses that gap through the development of the ESG–AI Strategic Convergence Model (EASCM).

Three research questions organize the investigation:

1. How does BRI integrate ESG principles and AI capabilities within its digital transformation strategy?
2. What strategic mechanisms account for the relationship between ESG and AI integration at BRI?

3. What organizational and institutional factors support or constrain the implementation of ESG–AI convergence in a state-owned bank?

The article proceeds as follows. Section 2 reviews the relevant literature and develops the theoretical framework. Section 3 describes the research methodology. Section 4 presents and critically analyses the empirical findings, including the proposed EASCM. Section 5 draws conclusions, outlines theoretical contributions and practical implications, and identifies directions for future research.

LITERATURE REVIEW

Strategic Management and the Digital Transformation Challenge

This study adopts the Resource-Based View and Dynamic Capabilities Theory to explain how ESG and AI integration contributes to sustainable competitive advantage. Digital transformation is not simply technological modernization; it involves the fundamental reconfiguration of organizational processes, competitive logics, and business model architectures in ways that render established resource configurations inadequate and demand continuous renewal of capability. Dynamic Capabilities Theory Ellström et al. (2022) provides the most analytically precise framework for understanding how organizations navigate this condition. By distinguishing between the possession of ordinary operational capabilities and the higher-order capacity to sense emerging opportunities, seize them through organizational action, and reconfigure existing resource configurations accordingly, the framework draws attention to the organizational processes through which competitive positioning is actively constructed and reconstructed rather than merely inherited. In the banking context, where the challenge from financial technology entrants, the sophistication of regulatory requirements, and the expectations of increasingly digitally literate customers are all intensifying simultaneously, these higher-order sensing, seizing, and reconfiguring capabilities assume strategic significance.

Institutional Theory adds an explanatory dimension that neither the RBV nor Dynamic Capabilities frameworks fully capture. Gonzalez-Ruiz et al. (2024) foundational account of institutional isomorphism demonstrated that organizational behaviour is shaped not only by competitive pressures but by the normative expectations embedded in regulatory frameworks, industry standards, and stakeholder belief systems. Organizations adopt structures and practices that signal conformity to legitimate institutional models not exclusively or even primarily because such adoption maximizes economic efficiency, but because it generates the social authorization necessary for continued organizational functioning. For state-owned banks, this institutional dynamic operates with intensity: such institutions must simultaneously demonstrate commercial performance credibility and public development contribution, satisfying stakeholder audiences whose expectations may be in partial tension. This institutional complexity makes BRI a theoretically appropriate case for examining how strategic capability development including ESG–AI integration is shaped by and responsive to multiple, overlapping institutional logics.

ESG in Financial Institutions, Beyond Compliance Framing

Recent ESG research increasingly positions sustainability as a strategic organizational capability rather than merely a compliance requirement. ESG disclosure quality in banking is positively associated with reduced risk and enhanced market valuation but noted that this relationship is moderated by governance architecture: institutions with more sophisticated board oversight mechanisms extract more strategic value from ESG commitments than those

with weaker governance structures. This finding has important implications for the present study, as it suggests that the strategic value of ESG is not inherent in disclosure itself but emerges through the organizational capabilities and institutional structures through which sustainability commitments are operationalized. In the Indonesian banking context documented considerable heterogeneity in ESG adoption with some institutions pursuing genuine strategic integration while others maintain what amounts to a compliance theater, producing disclosures that satisfy regulatory requirements without generating meaningful organizational capability.

What remains largely unexplored in this literature is the relationship between ESG integration and technological capability development, particularly whether and how AI systems can serve as the operational infrastructure through which sustainability commitments are enacted, monitored, and continuously improved. Huang et al. (2023) touched on this possibility in examining the organizational conditions for ESG ladder-climbing but stopped short of theorizing the specific mechanisms through which technological and sustainability capabilities might co-evolve. It is precisely this gap that motivates the theoretical framework and empirical analysis developed in this article.

AI in Banking, Strategic Resource or Operational Instrument?

The rapid integration of AI into banking operations has prompted a parallel evolution in how technology is theorized within strategic management and financial services research. Early contributions were primarily operational in orientation, documenting improvements in credit risk assessment accuracy, fraud detection rates, and customer service efficiency (Mosteanu & Faccia, 2020). More recent work has adopted a more explicitly strategic frame, engaging with questions of how AI capabilities relate to competitive positioning, resource accumulation, and sustained performance advantage. AI capabilities supported by proprietary banking datasets can function as VRIN resources that generate sustainable competitive advantage.

Lanzolla et al. (2020) strengthens this argument by demonstrating that digital capabilities, including AI systems, tend to generate compounding rather than linear returns: accumulated data assets progressively improve model performance, widening the gap between early movers and followers over time. This path-dependency has critical strategic implications it suggests that the window for achieving durable AI-based competitive advantage is not indefinitely open, and that institutions that delay substantive AI investment risk finding themselves in positions of structural competitive disadvantage that become progressively harder to reverse. Despite these insights, the strategic AI literature in banking has engaged minimally with ESG dimensions, treating sustainability concerns as external constraints on AI deployment rather than as potential design principles that could shape AI capability in strategically distinctive and advantageous ways.

Financial Inclusion as the ESG–AI Strategic Nexus

Digital financial inclusion understood as the genuine availability of quality financial services to underserved populations through digital channels has emerged as one of the most analytically productive domains for examining the intersection of ESG social objectives and AI capability development. In markets like Indonesia, where substantial segments of the population and the MSME sector have historically been excluded from formal financial systems, the expansion of digital financial access constitutes both a developmental priority and a commercially significant market opportunity. The structural conditions that make this population financially underserved, limited formal credit history, geographic distance from branch networks, income variability are precisely the conditions for which AI-driven

alternative credit assessment offers the most distinctive advantages over conventional underwriting approaches.

This convergence is strategically significant for reasons that go beyond the obvious commercial logic. When AI capabilities are deliberately oriented toward financial inclusion objectives rather than optimized primarily for efficiency or risk minimization the resulting systems accumulate proprietary data assets that reflect the specific characteristics of underserved markets. These data assets are not merely commercially valuable; they generate institutional relationships, trust networks, and community presence that constitute additional layers of competitive moat reinforcing the technical advantages of the AI system itself. The ethical alignment of AI deployment with ESG social goals also generates a form of institutional legitimacy with regulators and development finance institutions that translates into concrete financial benefits, access to sustainability-linked capital at preferential pricing, regulatory goodwill, and strategic positioning as a responsible financial inclusion champion.

Demirgüç-Kunt et al. (2022) and Sustainable Banking and Finance Network (2024) have documented the macroeconomic significance of digital financial inclusion in developing economies but have not theorized the specific mechanisms through which inclusion-oriented AI deployment generates ESG-aligned competitive advantage at the firm level. Bridging this gap requires a conceptual framework that explicitly accounts for the feedback dynamics between AI capability development and ESG value creation a framework that the EASCM, developed in Section 4.5, is intended to provide.

Theoretical Framework

This study adopts an integrated multi-lens theoretical framework combining three complementary perspectives the Resource-Based View (Bhandari et al., 2022), Dynamic Capabilities Theory (Ellström et al., 2022), and Institutional Theory (Gonzalez-Ruiz et al., 2024; Santoso et al., 2026) selected because the ESG–AI integration phenomenon it examines operates simultaneously at the levels of resource configuration, organizational process, and institutional context. No single framework captures all three levels with adequate precision.

The Resource-Based View provides the foundational logic for evaluating whether ESG-related practices and AI capabilities constitute genuine sources of sustainable competitive advantage. Its VRIN criteria offer a systematic basis for distinguishing between capabilities that generate durable strategic value and those that represent operational necessities offering no distinctive advantage. Dynamic Capabilities Theory extends this foundation by directing attention toward the organizational processes through which resource configurations are actively constructed and reconstructed over time particularly relevant for understanding how banks translate sensing of sustainability demands and technological opportunities into institutionalized operational capabilities. Institutional Theory completes the framework by situating organizational strategy within the normative and regulative environment that shapes which strategic choices are perceived as legitimate, feasible, and desirable. For a state-owned bank navigating developmental and commercial mandates simultaneously, this institutional dimension is not peripheral but constitutive it shapes the strategic options that management can credibly pursue and the stakeholder audiences whose legitimation is organizationally consequential.

RESEARCH METHOD

Research Design and Philosophical Orientation

This study adopts a qualitative research design grounded in an interpretive epistemological orientation. The choice of qualitative methodology reflects the nature of the research questions, which are concerned not with measuring the frequency or magnitude of ESG–AI integration outcomes but with understanding the strategic processes, institutional mechanisms, and organizational logics through which integration occurs. These are inherently meaning-laden phenomena that resist adequate quantification: the question of why BRI chose to co-design its AI systems around financial inclusion objectives, rather than pursuing efficiency optimization alone, cannot be answered by measuring correlations between variables but requires interpretive engagement with the strategic reasoning and institutional pressures that shaped this choice.

A single case study research strategy is employed, following the methodological principles established by Hunziker and Blankenagel (2021). The case study design is particularly appropriate for this investigation because ESG–AI integration at BRI cannot be meaningfully analysed in isolation from the bank's organizational history, state-ownership mandate, regulatory environment, and evolving strategic trajectory contextual conditions that constitute the phenomenon rather than representing noise around it. Within the qualitative research tradition, the single case study enables the depth of contextual engagement and interpretive precision that the research questions demand, while the selection of BRI on theoretically motivated grounds ensures that the case contributes to analytical generalization the extension and refinement of theoretical propositions rather than statistical generalization (Hunziker & Blankenagel, 2021).

Case Selection and Justification

BRI was selected as the focal case based on four theoretically motivated criteria. First, its status as Indonesia's largest state-owned commercial bank, operating within a complex institutional environment that combines commercial profitability requirements with explicit public development mandates, makes it a paradigmatic instance of the institutional conditions most relevant to the research questions. The bank's dual mandate serving shareholders while advancing national financial inclusion objectives generates precisely the institutional tensions through which the strategic logic of ESG–AI integration is most fully expressed and most analytically visible.

Second, BRI has demonstrated sustained, publicly documented commitment to both ESG principles and AI-based digital transformation throughout the study period. Its comprehensive sustainability reporting against GRI Standards and TCFD recommendations, its coverage by major international ESG rating agencies including MSCI, Sustainalytics, and S&P Global, and its published disclosures regarding AI investment and deployment provide a rich documentary corpus that enables rigorous analysis without dependence on restricted internal sources. Third, BRI's focus on MSME lending and rural financial access creates a strategic context in which the alignment between ESG social objectives and AI capability development is not merely rhetorical but operationally constitutive the bank's AI systems are literally designed around the financial inclusion challenge that defines its ESG social commitments. Fourth, the availability of institutionally audited, publicly accessible documentary evidence across multiple reporting periods ensures that analytical conclusions can be grounded in verifiable sources and subjected to independent scrutiny.

Data Sources and Collection

Documentary data were collected from multiple institutionally distinct source categories spanning 2021 to 2023. Primary institutional sources included BRI Annual Reports (2021, 2022, 2023), BRI Sustainability Reports (2021, 2022, 2023), and official regulatory documents from the Financial Services Authority (OJK) and Bank Indonesia. Supplementary institutional assessments comprised ESG rating reports and score summaries from MSCI, Sustainalytics, and Bloomberg Intelligence. Academic literature in strategic management, digital banking, and sustainability provided theoretical and interpretive scaffolding for analysis.

Source selection followed a structured eligibility procedure based on direct relevance to ESG commitments, AI deployment strategies, digital transformation objectives, and regulatory compliance dimensions of BRI's organizational strategy. Only publicly verified and institutionally audited documents were incorporated into the analytical corpus, a criterion that serves both epistemological and ethical functions, ensuring that the data foundation is simultaneously credible and replicable. In total, 47 primary documents were included in the analytical corpus. This multi-source design strengthens analytical rigor through data triangulation, consistent with the methodological principles (Hunziker and Blankenagel, 2021).

To improve analytical transparency, the study employed a multi-stage coding process consisting of open coding, axial coding, and selective coding. Initial codes were generated from recurring strategic narratives identified across annual reports, sustainability disclosures, and regulatory documents. These codes were subsequently grouped into broader analytical categories and synthesized into higher-order strategic themes aligned with the study's theoretical framework.

Table 1. Illustrative Coding Framework and Theme Development

Initial Code	Category	Strategic Theme	Representative Evidence Source
AI-based credit scoring	Financial inclusion mechanism	ESG–AI convergence in MSME financing	BRI Sustainability Report (2023)
Digital lending platform	Inclusive banking access	ESG–AI convergence in MSME financing	BRI Annual Report (2022)
Automated ESG monitoring	Governance digitalization	AI-enabled ESG governance	Sustainability Disclosure (2023)
Real-time compliance analytics	Risk and governance control	AI-enabled ESG governance	OJK Digital Banking Framework
Proprietary AI ecosystem	Strategic digital capability	Sustainable competitive advantage	BRI Integrated Report (2023)
Data accumulation capability	Platform network effects	Sustainable competitive advantage	Annual Report (2021–2023)
ESG communication strategy	Institutional legitimacy	Legitimacy and stakeholder alignment	Sustainability Report (2022)
Regulatory ESG alignment	Institutional adaptation	Legitimacy and stakeholder alignment	OJK ESG Banking Roadmap

The coding process enabled the identification of recurring strategic patterns linking ESG initiatives and AI deployment within BRI's digital transformation agenda. The resulting thematic structure also strengthened analytical consistency by connecting empirical observations with the Resource-Based View, Dynamic Capabilities Theory, and Institutional Theory.

Data Analysis, Coding Process and Thematic Development

Analysis followed a two-stage sequential procedure combining content analysis and thematic analysis selected because the combination captures both the explicit salience of ESG–

AI references across documentary sources and the deeper strategic meanings and patterns underlying those references (Braun & Clarke, 2019).

The coding process proceeded through three analytically distinct stages. Open coding involved close, repeated reading of all documents without predetermined categories, generating an initial list of approximately 180 conceptual codes capturing specific references to AI deployment, ESG commitments, governance mechanisms, competitive positioning, institutional relationships, and regulatory responses. At this stage, codes were kept deliberately descriptive and close to the documentary language for example, AI credit scoring for MSME, ESG real-time monitoring, OJK regulatory compliance narrative, and sustainability bond pricing advantage.

Axial coding involved systematic examination of relationships among open codes, reorganizing them around core categorical dimensions that captured the structural logic connecting individual observations. This stage generated eight intermediate categories, AI infrastructure development, ESG governance integration, financial inclusion strategy, competitive resource accumulation, legitimacy management, regulatory compliance, stakeholder narrative calibration, and institutional positioning. These categories were not derived deductively from the theoretical framework but emerged inductively from the data before being interpreted considering the theoretical perspectives.

Selective coding brought the intermediate categories into systematic relationship with one another and with the study's theoretical frameworks, identifying four overarching strategic themes corresponding to the four themes presented in the findings section as the central organizing constructs of the analytical narrative. The selective coding stage involved iterative cross-validation of theme coherence across the full document corpus, ensuring that each theme was robustly supported by evidence from multiple source types and multiple reporting years rather than isolated in a single document or period. An audit trail documenting the movement from individual coded passages to intermediate categories and final themes was maintained throughout the analysis, enabling independent verification of the interpretive process.

Thematic Analysis Stages and Trustworthiness

Thematic analysis followed the six-phase protocol established by Braun and Clarke (2006). Familiarization involved immersive, repeated engagement with the full documentary corpus to develop deep contextual understanding before coding commenced. Systematic initial code generation then produced the open code inventory described above. Collation of codes into candidate themes involved grouping related codes into thematic clusters and identifying the relational logic that gave each cluster coherence as a strategic theme. Recursive review and refinement of themes against the full dataset ensured that no significant counterevidence had been overlooked and that theme boundaries were appropriately defined neither too narrow to capture the full range of relevant evidence nor too broad to retain analytical precision. Definition and naming of final themes involved articulating the core claim of each theme in language that was both analytically precise and theoretically connected. Production of the analytical narrative translated the thematic structure into the critical interpretive discussion presented in Section 4.

Trustworthiness was established through four criteria adapted from Lincoln and Guba's framework for qualitative rigor. Credibility was achieved through data triangulation across annual reports, sustainability disclosures, regulatory documents, and third-party ESG assessments with triangulation specifically designed to test whether themes identified in corporate disclosures were corroborated or contested by independent institutional sources. Transferability was addressed through the provision of thick contextual description, enabling

readers to assess the applicability of findings to other institutional settings rather than claiming universal generalizability. Dependability was ensured through the documented audit trail linking all analytical interpretations to specific documentary sources. Confirmability was maintained through an explicit coding framework, summarized in Table 2, that renders the analytical process transparent and open to independent review.

Table 2. Research Framework Summary

Component	Description	Theoretical Basis	Coding Stage	Data Source
Research Design	Qualitative single case study, interpretive epistemology	Hunziker and Blankenagel (2021)	N/A	N/A
Case	Bank Rakyat Indonesia (BRI), 2021–2023	Purposive case selection	Open coding (contextual familiarization)	BRI Annual & Sustainability Reports
Open Coding	~180 descriptive codes from documentary corpus	Braun and Clarke (2019)	Familiarization, initial code generation	47 primary documents
Axial Coding	8 intermediate categories relating codes	Grounded theory principles	Code collation, candidate theme development	All source types
Selective Coding	4 strategic themes, theoretical integration	RBV, Dynamic Capabilities, Institutional Theory	Theme review, definition, analytical narrative	Triangulated across all sources
Trustworthiness	Credibility, transferability, dependability, confirmability	Adler (2022)	Audit trail, triangulation, thick description	All source types
Outcome	ESG–AI Strategic Convergence Model (EASCM)	Original theoretical contribution	Integrated thematic synthesis	All sources combined

RESULTH AND DISCUSSION

Analysis of the 47-document corpus through the three-stage coding process yielded four interlocking strategic themes constituting BRI's ESG–AI integration architecture. Crucially, these themes are not analytically independent, they form a mutually constitutive strategic configuration in which each theme both enables and depends upon the others. Table 3 provides a structured thematic overview before each theme is developed in detail.

Table 3. Thematic Overview of ESG–AI Integration at BRI

Theme	Core Strategic Mechanism	ESG–AI Linkage	Theoretical Anchoring	Key BRI Evidence
T1, Governance Innovation	AI-enabled ESG measurement and automated reporting	AI provides G-dimension precision, ESG mandates AI governance standards	Dynamic Capabilities, Institutional Theory	BDAC, IDR 3.2 trillion AI investment (2023)

Theme	Core Strategic Mechanism	ESG–AI Linkage	Theoretical Anchoring	Key BRI Evidence
T2, Inclusive Growth Engine	AI-powered alternative credit scoring extending MSME access	BRISPOT instantiates Social ESG objective	RBV (VRIN), Financial Inclusion Literature	32.4 million MSME borrowers, NPL 2.8% (2023)
T3, Competitive Moat Construction	Proprietary AI ecosystems as VRIN resources, ESG reputational moat	Data assets + ESG reputation create compound advantage	Resource-Based View (Lanzolla et al., 2020)	MSME loan CAGR 9.1% vs. sector 6.3% (2021–2023)
T4: Legitimacy Architecture	Calibrated ESG–AI narrative for multiple institutional audiences	Responsible AI framing enhances ESG credibility with rating agencies	Institutional Theory (Santoso et al., 2026)	Green Bond USD 500M (2021), Sustainability Bond USD 750M (2022)

Theme 1, AI-Enabled ESG Measurement as Governance Innovation

A foundational observation emerging from the documentary analysis is that BRI's deployment of AI-powered data analytics extends significantly beyond operational efficiency applications to function as the technical backbone of its ESG governance architecture. The establishment of the BRI Data Analytics Centre (BDAC), documented in BRI's Sustainability Report (2023), represents an organizational investment in institutional capacity for ESG measurement, verification, and real-time reporting across a network of more than 10,500 branches. This configuration is qualitatively distinct from the compliance-oriented ESG reporting that identified as characteristic of many Indonesian banking institutions: rather than assembling retrospective disclosures from decentralized data silos, BRI has invested in AI infrastructure that enables continuous, institution-wide ESG monitoring.

Interpreted through the Dynamic Capabilities framework, this governance innovation constitutes a seizing capability the organizational capacity to translate awareness of regulatory and market ESG demands into concrete institutional mechanisms that generate durable strategic value. The BDAC's ability to integrate environmental, social, and governance data streams across a geographically dispersed branch network enables managerial decision-making at a level of granularity that was structurally unavailable in pre-digital reporting environments. Moreover, the progressive improvement of AI diagnostic accuracy as the system processes increasing volumes of ESG-relevant data creates a capability trajectory characterized by organizational learning and deepening precision rather than static efficiency a dynamic consistent with Ellström et al. (2022) argument that genuinely strategic capabilities improve through use.

Despite improving ESG governance efficiency, AI-enabled monitoring systems also introduce risks related to algorithmic accountability, data reliability, and governance oversight. The reciprocal dynamic wherein ESG governance requirements drive AI investment, which in turn enhances ESG measurement quality, which strengthens ESG ratings and sustainability capital market access constitutes the Governance Integration dimension of the EASCM proposed in Section 4.5. This finding extends Dynamic Capabilities Theory by demonstrating that AI-enabled ESG governance can function as a seizing mechanism through which regulatory sustainability demands are transformed into evolving operational systems generating strategic value that compounds over time.

Theme 2, Digital Financial Inclusion as the ESG–AI Strategic Nexus

Among all the domains in which ESG and AI converge within BRI's strategic architecture, digital financial inclusion is the most empirically prominent, organizationally distinctive, and theoretically most significant. The BRISPOT credit assessment engine represents the operational heart of this convergence: employing machine learning algorithms trained on BRI's extensive microfinance transaction database accumulated over more than 128 years of relationship banking with Indonesian MSME clients BRISPOT generates credit recommendations within minutes for loan applicants with limited formal credit history, replacing a multi-day manual underwriting process that effectively excluded large segments of the MSME population from formal credit access. By the end of 2023, BRISPOT had facilitated loan disbursements to over 32.4 million MSME borrowers, with a non-performing loan ratio of 2.8% significantly below the Indonesian banking sector average (BRI Sustainability Report, 2023).

BRISPOT demonstrates how proprietary MSME transaction datasets can create sustainable competitive advantage through AI-driven credit assessment capabilities. The BRImo digital banking platform complements BRISPOT's credit function, reporting 38.7 million registered users as of December 2023 a compound annual growth rate of approximately 88% from 10.9 million users in 2021 (BRI Annual Report, 2023). The behavioral data generated through BRImo's AI-enabled features including personalized product recommendations and the SAPA BRI conversational interface feeds back into BRISPOT's credit models, creating an integrated ecosystem in which inclusion-oriented AI deployment generates data assets that deepen the very AI capabilities driving inclusion. This feedback dynamic is central to the competitive advantage argument.

It is important, however, to avoid an uncritically celebratory reading of these findings. Several analytical concerns deserve acknowledgment. First, the assumption that algorithmic credit assessment is inherently inclusion-promoting requires scrutiny: AI systems trained on historical lending data may systematically underestimate creditworthiness for demographic groups that were excluded from formal credit in the training period, perpetuating historical exclusion under a technological veneer of objectivity. BRI's sustainability disclosures reference algorithmic fairness audits but do not provide sufficient detail to assess whether these audits employ best-practice methodologies or constitute primarily compliance theatre. Second, the NPL ratio of 2.8%, while below sector average, masks distributional variation across borrower segments and geographic regions that aggregate figures cannot capture. Third, the dependency of 32.4 million MSME borrowers on AI-mediated credit assessment creates systemic risk model failure, data breaches, or regulatory interventions could simultaneously affect access to credit for millions of economically vulnerable borrowers. These risks are not merely operational, they represent ESG governance vulnerabilities that the existing analytical framework does not fully address.

Theme 3, Sustainable Competitive Advantage Through Proprietary AI Ecosystems

Analysis of BRI's strategic communications and investment disclosures across 2021 to 2023 reveals a deliberate strategy of constructing an interlocking proprietary AI ecosystem designed to generate competitive advantages that compound over time. The ecosystem encompassing BRISPOT for credit assessment, SAPA BRI for customer service automation, BRImo for digital banking, BRIAPI for open banking infrastructure, and BDAC for analytics governance is architected as a mutually reinforcing system: each component generates data and insights that improve the performance of the others, while the integrated whole creates network

effects and switching costs that are structurally unavailable to competitors lacking comparable ecosystem breadth and depth.

BRI's integrated AI ecosystem creates data-driven network effects that strengthen long-term competitive positioning and financial inclusion capabilities. The competitive advantage generated through this strategy is most directly evidenced in MSME market share dynamics: BRI's MSME loan portfolio grew from IDR 587.6 trillion in 2021 to IDR 698.9 trillion in 2023, a compound annual growth rate of 9.1% materially outpacing the Indonesian banking sector's overall MSME credit growth rate of 6.3% over the same period (BRI Annual Report, 2023). This outperformance is consistent with the compounding digital advantage argument advanced by Lanzolla et al. (2020), each new MSME borrower onboarded through BRISPOT generates additional training data, improves model performance, potentially deepens the borrower relationship through BRImo, and contributes to the data assets that sustain competitive moat over time.

A critical perspective, however, requires acknowledging that the scalability of this model is not unlimited. BRI's competitive advantage in MSME AI is structurally dependent on sustained investment in AI infrastructure, human capital with the technical capacity to maintain and improve complex ML systems, and organizational governance frameworks capable of managing the ethical and operational risks that accompany large-scale AI-mediated lending. As digital-native challengers fintech lenders with potentially more agile development cycles and less legacy infrastructure enter the MSME credit market with increasing sophistication, BRI's data advantage may narrow over time, particularly for urban MSME segments where alternative data sources and digital financial footprints are more abundant. The long-term sustainability of the competitive moat depends on continued ecosystem investment and innovation rather than on any static advantage.

Theme 4, Institutional Legitimacy Architecture Through ESG–AI Narrative Alignment

The fourth strategic theme concerns the deliberate construction of an integrated ESG–AI narrative calibrated to address the distinct legitimacy expectations of multiple institutional audiences simultaneously. Documentary analysis reveals a sophisticated stakeholder-differentiated communication strategy that merits both analytical recognition and critical interrogation.

For international institutional investors and ESG rating agencies including MSCI, Sustainalytics, and S&P Global BRI's narrative foregrounds responsible AI governance frameworks, algorithmic fairness audit mechanisms, explainability standards for credit decisions, and data privacy protection architecture. This narrative positioning addresses a recognized concern among ESG-oriented investors, that AI deployment may introduce governance and reputational risks that offset or undermine sustainability performance gains (Floridi et al., 2020). By explicitly framing AI governance as an integral component of ESG governance rather than a separate technology risk domain BRI positions its AI investment as ESG-value-additive rather than ESG-risk-generating.

For domestic regulatory audiences including OJK, Bank Indonesia, and the Ministry of State-Owned Enterprises the narrative foregrounds national development alignment, positioning AI as an enabler of financial inclusion, digital literacy, and rural economic empowerment consistent with Visi Indonesia Digital 2045 and OJK's Financial Inclusion Roadmap (Otoritas Jasa Keuangan, 2021). This alignment serves coercive legitimacy functions, reducing regulatory friction and reinforcing BRI's strategic position as an indispensable partner in Indonesia's digital development agenda. For development finance partners including the Sustainable Banking and Finance Network, ADB, and bilateral development institutions BRI's

narrative emphasizes climate finance mechanisms and social impact measurement capabilities enabled by its AI analytics infrastructure, enabling access to concessional funding and sustainability-linked capital at preferential pricing. This legitimacy strategy contributed to successful sustainability bond issuance and lower financing costs while also increasing the importance of transparent ESG and AI governance.

The ESG–AI Strategic Convergence Model (EASCM)

Synthesizing the four thematic findings, this study introduces the ESG–AI Strategic Convergence Model (EASCM) as its primary theoretical contribution. The model represents a departure from both conventional RBV analyses which treat capabilities as relatively stable resource stocks and conventional Institutional Theory accounts which treat legitimacy as a condition to be maintained rather than actively constructed through capability investment. The EASCM posits that sustainable competitive advantage in digitally transforming financial institutions arises specifically when ESG commitments and AI capabilities are co-designed as mutually reinforcing elements, such that each reinforces the strategic value and institutional credibility of the other across four mutually constitutive dimensions.

The Governance Integration dimension recognizes that AI infrastructure serves as the technical backbone for ESG measurement and verification, while ESG governance frameworks provide the ethical accountability architecture within which AI development and deployment operate. This reciprocal relationship ensures that AI investment strengthens ESG quality, and ESG standards constrain AI risk exposure creating a governance dynamic that is simultaneously performance-enhancing and risk-mitigating. The Value Creation Alignment dimension reflects the deliberate orientation of AI capabilities toward ESG social and environmental objectives, generating measurable societal outcomes while simultaneously producing the VRIN resources particularly proprietary data assets that accumulate through inclusion-oriented deployment that sustain competitive advantage. The Competitive Moat Construction dimension describes how the combination of AI data ecosystems and ESG-based reputational capital creates compound, path-dependent advantages that neither ESG commitments nor AI capabilities generate independently. The Legitimacy Amplification dimension captures how integrated ESG–AI strategies generate mutually reinforcing legitimacy signals across regulatory, investor, and civil society audiences, reducing financing costs and regulatory friction in ways that sustain the organization's institutional position.

EASCM makes a distinctive contribution relative to existing frameworks in three respects. Unlike the digital transformation framework articulated by Lanzolla et al. (2020), which treats AI as a standalone capability generating compounding returns, the EASCM explicitly incorporates ESG commitments as constitutive design principles that shape the strategic direction and social legitimacy of AI deployment. Unlike the ESG capability framework developed in the sustainability, which focuses on ESG as a governance and risk management resource, the EASCM introduces AI as the technical mechanism through which ESG capabilities are enacted on institutional scale. Unlike traditional RBV perspectives, which evaluate capabilities against static VRIN criteria, the EASCM introduces a dynamic mechanism: ESG-AI co-design generates capabilities whose VRIN characteristics strengthen over time through compounding data accumulation, deepening organizational learning, and progressive legitimacy consolidation.

Table 4. EASCM Dimensional Analysis: ESG and AI Roles with BRI Evidence

EASCM Dimension	ESG Role	AI Role	BRI Empirical Evidence	Critical Risks
Governance Integration	Mandates accountability standards and ethical boundaries for AI	Enables real-time ESG measurement and automated reporting	BDAC across 10,500+ branches, IDR 3.2T AI investment (2023)	Algorithmic governance risk, AI measurement bias
Value Creation Alignment	Directs AI toward social and environmental objectives	Alternative credit scoring enables access for unbanked populations	BRISPOT, 32.4M MSME borrowers, NPL 2.8% (2023)	Algorithmic bias, systemic inclusion risk
Competitive Moat Construction	ESG reputation creates reputational moat and sustainability financing access	Proprietary AI ecosystems generate compounding data advantages	MSME CAGR 9.1% vs. sector 6.3% (2021–2023)	Fintech competition, scalability limitations
Legitimacy Amplification	ESG narrative reduces regulatory friction, strengthens investor confidence	Responsible AI framing enhances ESG credibility with rating agencies	Green Bond USD 500M (2021), Sustainability Bond USD 750M (2022), 15–25 bps saving	Greenwashing scrutiny, narrative credibility risk

Comparative Analysis and Structural Limitations

To contextualize the EASCM findings, Table 5 presents a comparative analysis of ESG–AI integration approaches across BRI and three globally prominent banking institutions: JPMorgan Chase, HSBC, and DBS Bank. The comparison is not intended as a performance ranking but as a structural analysis of the institutional conditions and strategic choices that shape distinct ESG–AI integration trajectories. The comparison draws on each institution’s own published disclosures rather than a common, independently verified dataset, and the resulting classifications (e.g., “high,” “moderate”) are the authors’ qualitative judgments rather than scores derived from a standardized instrument; it is offered as an illustrative positioning exercise rather than a systematic comparative methodology, and should be read accordingly.

Table 5. Comparative Analysis of ESG–AI Integration, BRI and Selected Global Banks

Dimension	BRI	JPMorgan Chase	HSBC	DBS Bank
Strategic Orientation	Inclusion-driven sustainability	Profit and risk optimization	Sustainability-led strategy	Digital-first banking
Primary ESG Focus	Social inclusion (MSME)	Governance and risk transparency	Environmental sustainability	Balanced ESG approach
AI Deployment	Credit scoring; inclusion analytics	Risk analytics; fraud detection	ESG analytics; compliance	Customer experience; automation
ESG–AI Integration Level	High — deeply co-designed	Moderate — parallel approach	Moderate-High — integration emerging	High — platform-based integration
Primary Data Advantage	MSME proprietary dataset (128 years)	Global financial transaction data	ESG and compliance dataset	Digital ecosystem behavioral data
Key Strategic Limitation	Scalability, algorithmic bias risk	ESG not fully embedded in AI design	Slower digital transformation pace	Limited rural inclusion focus

The comparative evidence suggests that the ESG–AI co-design approach distinctive to BRI and, to a lesser extent, DBS represents one end of a strategic spectrum, with most global banking institutions maintaining ESG and AI as strategically parallel rather than genuinely integrated programs. JPMorgan Chase's AI capabilities are oriented primarily toward risk management and efficiency optimization, with ESG maintained as a compliance and stakeholder reporting function. HSBC shows stronger ESG-AI alignment in the environmental dimension, particularly in climate risk analytics, but its AI deployment does not extend to the kind of inclusion-oriented credit assessment that constitutes the core of BRI's integration logic. DBS represents the closest global analogy to BRI's platform-based integration approach, but with a markedly different social orientation focused on urban digital consumers in developed and developing Asian markets rather than rural MSME populations.

These comparisons strengthen the argument that BRI's ESG–AI convergence is not simply a function of favourable institutional conditions but reflects deliberate strategic choices about the design principles governing AI development choices that are analytically replicable in other emerging-market banking contexts sharing comparable institutional features, even if the specific product configurations and market positions would differ substantially.

CONCLUSION

This article has examined the strategic integration of ESG principles and AI capabilities within BRI's digital transformation strategy over the 2021–2023 period, developing four interrelated analytical themes through a qualitative single case study design informed by three complementary theoretical frameworks. Returning to the three research questions: BRI appears to integrate ESG and AI primarily through AI-enabled ESG governance, AI-assisted MSME credit assessment, a proprietary data ecosystem, and legitimacy-oriented narrative alignment (RQ1); the strategic mechanism connecting the two is co-design rather than parallel management, with each domain shaping the other's development (RQ2); and this co-design appears to be supported by BRI's scale and state mandate, while remaining constrained by data-quality, algorithmic-bias, and disclosure-verification limitations (RQ3). Read as interpretations of BRI's public disclosures rather than as verified organizational facts, the evidence is consistent with the proposition that when ESG and AI are co-designed as mutually reinforcing strategic capabilities rather than managed as independent programs, the resulting configuration is associated with competitive advantages, institutional legitimacy, and governance quality that neither capability appears to produce independently.

THEORETICAL CONTRIBUTIONS

Three principal contributions to strategic management and sustainability literature emerge from this study. The ESG–AI Strategic Convergence Model constitutes the most substantial theoretical contribution, offering a conceptual framework that articulates the mechanisms through which ESG and AI generate mutually reinforcing strategic value across governance, value creation, competitive positioning, and legitimacy dimensions. Unlike existing digital transformation frameworks, which treat sustainability as peripheral, or ESG capability frameworks, which are technologically underspecified, the EASCM integrates both domains into a coherent causal architecture with testable theoretical implications.

The study also advances Dynamic Capabilities Theory by demonstrating that ESG–AI co-design constitutes a form of higher-order capability one that enables organizations to sense sustainability-related opportunities, seize them through AI-enabled governance and inclusion

mechanisms, and reconfigure their institutional positioning accordingly. Finally, the study enriches Institutional Theory by illustrating that legitimacy is not merely maintained through conformity to institutional expectations but is actively constructed through capability investment particularly in contexts where ESG and AI claims can be made mutually credible through their operational interdependence.

PRACTICAL IMPLICATIONS

For banking executives, the findings suggest that ESG–AI integration should be treated as a strategic design challenge rather than a governance overlay. Achieving genuine integration requires not merely the deployment of AI for ESG reporting purposes or the adoption of ESG metrics as AI evaluation criteria, but the deliberate co-design of AI system architectures around ESG social objectives from the earliest stages of capability development. These demands coordinated governance across sustainability, technology, and risk management functions, along with investment in the unified data infrastructure that makes real-time ESG monitoring technically feasible.

For policymakers and regulators, the BRI evidence suggests that regulatory frameworks can function as catalysts for capability co-design when they require not merely ESG disclosure but evidence of the operational mechanisms through which sustainability objectives are enacted. OJK's Sustainable Finance Roadmap, in combination with its AI governance guidelines, creates precisely this incentive structure. Development finance institutions may similarly find that BRI's inclusion-driven ESG–AI model offers a viable template for scaling responsible digital finance in comparable emerging-market contexts, provided that algorithmic accountability and institutional governance quality can be independently verified.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Several methodological limitations circumscribe the findings. Reliance on a single case design, while appropriate for the exploratory objectives and the analytical depth these require, limits direct generalizability; the analytical framework developed here must be tested across diverse institutional contexts before its broader applicability can be established. The secondary documentary data design restricts access to informal organizational processes, internal deliberations, and implementation conflicts that primary qualitative methods would capture more fully. The study period covers only three years, which may be insufficient to fully capture the path-dependent dynamics that are theoretically central to the EASCM's competitive advantage arguments.

Future research might address these limitations through comparative multi-case studies across private commercial banks, digital-native challengers, and foreign banking institutions in Indonesia and comparable emerging markets, enabling systematic testing of the EASCM propositions across varied institutional contexts. Mixed-method designs incorporating primary interview data with senior strategy, technology, and sustainability executives would provide richer access to the decision-making logic underlying ESG–AI integration choices. Longitudinal research designs extending beyond the three-year window examined here would be particularly valuable for assessing whether the compounding advantage dynamics posited in the EASCM are empirically sustained or whether they are subject to competitive erosion. Quantitative studies examining the relationship between ESG–AI integration intensity and financial performance outcomes would complement this study's qualitative, mechanism-focused contribution.

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E-COMMERCE CAPABILITY AND PERFORMANCE OF INDIGENOUS BUSINESSES IN ANAMBRA STATE, NIGERIA

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ABSTRACT

This study examined the relationship between e-commerce capability and the business performance of indigenous businesses in Anambra State, Nigeria, with particular focus on digital marketing capability, electronic payment system capability, and online customer engagement capability. The study adopted a descriptive survey research design using a quantitative approach. A stratified sampling technique was used to select 341 indigenous businesses from Onitsha, Nnewi, and Awka. Data were collected through structured questionnaires, and business performance was measured using respondents' perceptions of sales growth, customer satisfaction, operational efficiency, and competitiveness. Descriptive statistics and multiple regression analysis were performed using SPSS. The findings showed that digital marketing capability ($\beta = 0.338$, $p < 0.001$), electronic payment system capability ($\beta = 0.291$, $p < 0.001$), and online customer engagement capability ($\beta = 0.254$, $p < 0.001$) were positively and significantly associated with business performance. Based on the standardised beta coefficients, digital marketing capability had the strongest association with business performance, followed by electronic payment system capability and online customer engagement capability. The study concludes that stronger e-commerce capability is associated with higher perceived business performance among indigenous businesses in Anambra State. The study recommends greater investment in digital marketing, electronic payment systems, customer engagement platforms, and digital entrepreneurship training to improve business performance.

Keywords: E-commerce Capability; Digital Marketing Capability; Electronic Payment Systems; Online Customer Engagement; Indigenous businesses

INTRODUCTION

The global business environment has experienced significant transformation due to rapid advancements in information and communication technologies (ICTs), increased internet penetration, and ongoing digital innovation. E-commerce now serves as a primary driver of modern trade, fundamentally altering how firms conduct transactions, engage customers, and compete in international markets (United Nations Conference on Trade and Development, 2022; World Trade Organization, 2023). Organisations increasingly rely on digital platforms to facilitate transactions, enhance customer engagement, broaden market reach, and improve operational efficiency. Global evidence indicates a sustained expansion of e-commerce, attributed to greater internet access, widespread mobile connectivity, and the adoption of digital payment systems across economies (United Nations Conference on Trade and Development, 2022; World Trade Organization, 2023; Organisation for Economic Co-operation and Development, 2023). As a result, e-commerce capability has become a strategic organisational asset that enhances productivity, fosters innovation, and increases competitiveness within contemporary business systems (United Nations Conference on Trade and Development, 2022; Organisation for Economic Co-operation and Development, 2023; World Trade Organization, 2023). Globally, e-commerce has produced substantial benefits across sectors, including retail, banking, logistics, manufacturing, and services. Reports from global development institutions demonstrate that firms with advanced digital capabilities exhibit greater resilience, adaptability, and performance than those without. Across Africa, the expansion of internet infrastructure, fintech innovation, and mobile technology has accelerated e-commerce growth in numerous economies, including Nigeria. The continent's digital economy continues to expand as firms increasingly adopt online marketplaces, social commerce, and electronic payment systems to extend market reach and strengthen customer engagement (United Nations Conference on Trade and Development, 2022; World Bank, 2023). Digital platforms have enabled small and medium-sized enterprises (SMEs) to access broader markets, increase operational efficiency, and improve competitiveness (Organisation for Economic Co-operation and Development, 2023; World Bank, 2023). Nevertheless, persistent challenges such as inadequate infrastructure, limited digital skills, and unequal access to technology continue to constrain the development of e-commerce capability in many African countries (United Nations Conference on Trade and Development, 2022; World Trade Organization, 2023). While these challenges persist, empirical evidence consistently demonstrates that e-commerce capability positively impacts business performance and sustainability in developing economies (Organisation for Economic Co-operation and Development, 2023; World Bank, 2023).

In Nigeria, e-commerce adoption has grown substantially, driven by increased internet penetration, fintech development, widespread smartphone usage, and evolving consumer preferences. Indigenous businesses are increasingly utilising platforms such as WhatsApp, Instagram, Facebook, and various online marketplaces, in conjunction with electronic payment systems, to facilitate transactions and engage customers (World Bank, 2023; United Nations Conference on Trade and Development, 2022). Research on SMEs in Anambra State has demonstrated that digital tools, including online sales systems, social media engagement, and electronic payment platforms, significantly improve operational efficiency (Edokobi et al., 2024; United Nations Conference on Trade and Development, 2022). However, many indigenous firms continue to encounter infrastructure constraints, cybersecurity risks, and limited digital capabilities, which restrict their ability to fully leverage the benefits of e-commerce (World Bank, 2023; World Trade Organization, 2023).

Digital marketing capability, electronic payment system capability, and online customer engagement capability have been identified as important dimensions of e-commerce capability because they enable businesses to create value through digital channels. Digital marketing capability improves product visibility, expands market reach, and enhances customer acquisition, thereby contributing to higher sales and business growth (Chaffey & Ellis-Chadwick, 2022; Edokobi et al., 2024). Electronic payment system capability facilitates faster, secure, and more convenient transactions, reduces operational costs, and improves customer confidence, which enhances business efficiency and performance (United Nations Conference on Trade and Development, 2022; World Bank, 2023). Similarly, online customer engagement capability strengthens communication and interaction with customers through digital platforms, enabling businesses to respond promptly to customer needs, improve customer satisfaction, and encourage repeat patronage (Organisation for Economic Co-operation and Development, 2023; Verhoef et al., 2021). Empirical studies have consistently reported positive relationships between these digital capabilities and business performance among SMEs and other business organisations, suggesting that firms with stronger e-commerce capabilities are better positioned to achieve improved operational and market outcomes (Edokobi et al., 2024; United Nations Conference on Trade and Development, 2022).

Indigenous businesses are owned, managed, and controlled by Nigerian citizens and operate in Anambra State. The term is based on ownership rather than business size. Although many indigenous businesses are small and medium-sized enterprises (SMEs), the two terms do not mean the same thing. SMEs are classified using the number of employees and annual turnover, while indigenous businesses are identified by local ownership and control (SMEDAN, 2021). This study focuses on indigenous businesses because they operate under local business conditions and often face unique challenges in developing and using e-commerce capabilities (United Nations Conference on Trade and Development, 2022; World Bank, 2023).

A notable gap in the literature is the lack of analysis of e-commerce capability rather than general e-commerce usage or adoption. Existing research in Nigeria, including studies on SMEs in Anambra State, has primarily addressed e-commerce utilisation and the effects of ICT adoption on performance (Edokobi et al., 2024). In contrast, limited attention has been given to e-commerce capability as a multidimensional construct encompassing digital integration, strategic online operations, technological competence, and organisational readiness. Furthermore, most studies focus broadly on SMEs, placing insufficient emphasis on indigenous businesses operating in highly competitive commercial centres, such as those in Anambra State (United Nations Conference on Trade and Development, 2022; World Bank, 2023). This results in both contextual and conceptual gaps regarding the specific influence of e-commerce capability on performance outcomes, including efficiency, growth, and competitiveness among indigenous enterprises. In response, this study investigates the relationship between e-commerce capability and the performance of indigenous businesses in Anambra State, Nigeria. The study specifically aims to:

1. Examine the effect of digital marketing capability on the performance of indigenous businesses in Anambra State, Nigeria.
2. Assess the effect of the electronic payment system capability on the performance of indigenous businesses in Anambra State, Nigeria.
3. Determine the effect of online customer engagement capability on the performance of indigenous businesses in Anambra State, Nigeria.

LITERATURE REVIEW

E-Commerce Capability

E-commerce capability has been extensively studied as a determinant of SME performance; however, recent scholarship increasingly questions the assumption that its adoption inherently results in improved outcomes. Evidence from developing and emerging economies indicates that, although digital capability extends operational reach and market visibility, its effect on performance is highly dependent on complementary factors such as managerial competence, infrastructure quality, and organisational readiness (Ayokunmi et al., 2026). This suggests that e-commerce capability serves primarily as an enabling condition rather than a direct driver of performance. Additional studies support this perspective by demonstrating that firms with comparable levels of digital adoption often achieve different performance outcomes due to variations in strategic integration and absorptive capacity (Ghobakhloo & Iranmanesh, 2021; Clemente-Almendros et al., 2024). A critical body of literature identifies structural constraints that diminish the effectiveness of e-commerce capability within indigenous business environments. Factors such as unreliable infrastructure, cybersecurity vulnerabilities, and low digital literacy substantially limit firms' ability to translate digital investments into measurable performance improvements (Sandleni & Khoza, 2026). Furthermore, recent empirical evidence indicates that even after adopting e-commerce systems, firms frequently encounter challenges in integrating across business functions, resulting in underutilisation of digital tools and limited returns on investment (Clemente-Almendros et al., 2024; Ghobakhloo & Iranmanesh, 2021). Overall, previous studies consistently recognise e-commerce capability as an important organisational resource for improving business performance. However, there is less agreement on whether digital capability alone is sufficient to achieve superior performance. While some studies report direct performance improvements, others argue that the benefits depend on organisational readiness, managerial competence, and environmental conditions. These contrasting findings suggest that the performance implications of e-commerce capability remain context-dependent, particularly among indigenous businesses operating in developing economies.

Digital Marketing Capability

Digital marketing capability has emerged as a critical competitive resource for SMEs; however, its effectiveness varies considerably due to differences in execution quality and organisational maturity. Research indicates that firms utilising digital tools such as social media platforms, search engine optimisation, and online advertising typically achieve enhanced visibility and customer acquisition (Ilesanmi & Oyedepo, 2023; Chen et al., 2026). Nevertheless, these improvements are often temporary when firms lack structured digital strategies or the capacity to analyse consumer data effectively. This underscores that digital marketing capability encompasses not only technological adoption but also strategic and analytical competence. An expanding body of research indicates that many SMEs struggle to maintain effective digital marketing outcomes due to limited expertise and the rapidly evolving nature of digital platforms. Algorithm modifications, heightened online competition, and fragmented audience attention contribute to the instability of digital marketing performance across firms (Charles et al., 2025). Moreover, firms that implement uncoordinated digital initiatives frequently fail to convert engagement into sales, revealing a persistent gap between visibility and profitability in digital marketing (Ilesanmi & Oyedepo, 2023). Existing evidence supports the view that digital marketing capability enhances customer acquisition and market visibility. However, the reported performance gains vary across studies because firms differ in

their strategic planning, analytical capability, and ability to adapt to changing digital platforms. This suggests that digital marketing capability is more than the use of online promotional tools; it also reflects the firm's capacity to translate digital visibility into business outcomes.

Electronic Payment System Capability

The capabilities of electronic payment systems have become increasingly important to e-commerce performance, yet their influence on business outcomes remains inconsistent due to contextual and infrastructural challenges. Empirical research demonstrates that digital payment systems can increase transaction speed, reduce operational inefficiencies, and enhance customer convenience for SMEs (Ojo & Sadiq, 2022). Nevertheless, these advantages are frequently limited by inadequate technological infrastructure and unreliable system performance, especially in developing economies. This suggests that payment system capability alone is insufficient to ensure improved performance without supportive environmental conditions. A critical perspective highlights persistent obstacles, including cybersecurity risks, fraud concerns, and low consumer trust, which significantly undermine the effectiveness of digital payment system adoption. Studies indicate that many SMEs face operational disruptions resulting from unstable internet connectivity and elevated transaction costs associated with digital payment platforms (Obinna-Azubuike & Rahim, 2026; Clemente-Almendros et al., 2024). Additionally, limited technical expertise among indigenous business owners impedes their capacity to manage and optimise digital payment systems, thereby reducing anticipated performance improvements (Ojo & Sadiq, 2022; Clemente-Almendros et al., 2024). The evidence demonstrates that electronic payment systems improve transaction efficiency and customer convenience. At the same time, several studies argue that inadequate infrastructure, cybersecurity concerns, and limited technical expertise often reduce these benefits. This implies that the contribution of electronic payment capability to business performance depends on the organisational and technological environment in which it is deployed.

Online Customer Engagement Capability

Online customer engagement capability has become a strategic determinant of competitive advantage, although its effectiveness is increasingly influenced by platform dynamics and organisational responsiveness. Research demonstrates that firms engaging customers through social media platforms, interactive websites, and digital communication channels frequently achieve greater brand loyalty and customer satisfaction (Bazi et al., 2023; Ilesanmi & Oyedepo, 2023). However, engagement outcomes vary substantially depending on content quality, response time, and the consistency of interactions. This indicates that engagement capability encompasses both relational and operational dimensions. A critical evaluation of the literature reveals that sustaining meaningful engagement remains difficult for many SMEs due to resource limitations and digital skill gaps. Firms often struggle to maintain continuous customer interaction, leading to fragmented communication strategies and weakened brand relationships (Charles et al., 2025; Chen et al., 2026). Additionally, algorithm-driven changes in visibility on social media platforms reduce organic reach, forcing businesses to rely on paid engagement strategies that may not be financially sustainable (Feitosa & Mosconi, 2022). Research consistently links online customer engagement with stronger customer relationships and higher levels of customer satisfaction. Nevertheless, the strength of this relationship differs across firms because engagement outcomes depend on organisational responsiveness, resource availability, and changing platform algorithms. Consequently,

customer engagement should be viewed as a dynamic organisational competence rather than simply maintaining an online presence.

Performance of Indigenous Businesses

The performance of indigenous businesses is now frequently assessed using a multidimensional framework that incorporates financial outcomes, market expansion, and operational efficiency. Empirical research consistently demonstrates that digital capabilities positively influence SME performance by expanding market reach, increasing efficiency, and reinforcing customer relationships (Ghobakhloo & Iranmanesh, 2021; Sandleni & Khoza, 2026). Nevertheless, these effects are not uniform, as performance outcomes vary considerably among firms based on the degree of strategic alignment. A body of critical evidence shows that many indigenous businesses achieve only limited performance improvements despite adopting digital technologies. This is primarily due to structural barriers, such as inadequate infrastructure, restricted access to finance, and insufficient managerial capacity, which undermine the effectiveness of digital transformation initiatives (Ojo & Sadiq, 2022; Clemente-Almendros et al., 2024). Additionally, empirical studies indicate that firms with low absorptive capacity are unable to fully exploit digital investments, resulting in suboptimal performance (Ayokunmi et al., 2026). Empirical evidence suggests that digital capabilities contribute to improved business performance by strengthening operational efficiency, customer relationships, and market expansion. However, the magnitude of these improvements differs across firms because organisational resources and environmental conditions influence the extent to which digital capabilities translate into measurable performance outcomes. These unresolved differences provide a basis for further investigation in the context of indigenous businesses.

Theoretical Framework and Hypotheses

Dynamic Capability Theory offers a comprehensive explanation for the relationship between digital capabilities and firm performance in volatile environments. The theory posits that sustained competitive advantage relies on a firm's capacity to identify opportunities, capitalise on them, and reconfigure resources in response to environmental shifts (Teece et al., 1998; Chen et al., 2026; Charles et al., 2025). In digital business contexts, this framework elucidates why some firms achieve superior performance while others do not, despite having comparable access to technology. Empirical studies support this theoretical position by demonstrating that firms with stronger dynamic capabilities are better able to integrate digital marketing, payment systems, and customer engagement tools into coherent business strategies (Ojo & Sadiq, 2022; Clemente-Almendros et al., 2024). However, capability effectiveness depends on continuous learning, adaptation, and resource reconfiguration rather than static adoption. This reinforces the argument that e-commerce capability must be understood as an evolving organisational competence rather than a fixed technological asset.

In the context of this study, Dynamic Capability Theory provides the theoretical basis for explaining how the three dimensions of e-commerce capability contribute to business performance. Digital marketing capability reflects the firm's sensing capability by enabling it to identify market opportunities and changing customer preferences. Electronic payment system capability represents seizing capability because it allows firms to convert market opportunities into efficient and secure transactions. Online customer engagement capability reflects reconfiguring capability because it enables businesses to continually strengthen customer relationships and adapt communication strategies in response to market feedback. Together, these capabilities illustrate how firms deploy and continuously renew digital resources to improve business performance. The formulated hypotheses are given as:

H0₁: Digital marketing capability has a significant effect on the performance of indigenous businesses in Anambra State, Nigeria.

H0₂: Electronic payment system capability has a significant effect on the performance of indigenous businesses in Anambra State, Nigeria.

H0₃: Online customer engagement capability has a significant effect on the performance of indigenous businesses in Anambra State, Nigeria.

RESEARCH METHOD

Research Design and Study Area

This study adopts a descriptive survey research design grounded in a quantitative approach. This design enables the systematic collection of numerical data from indigenous businesses and supports statistical examination of relationships among variables. The research is conducted in Anambra State, Nigeria, with a particular focus on major commercial hubs including Onitsha, Nnewi, and Awka. These locations are selected for their high concentration of indigenous small- and medium-scale enterprises (SMEs) operating in retail trading, service delivery, manufacturing, and agro-processing sectors.

The indigenous business environment in these locations is characterised by diverse economic activities. Retail trading businesses include provision stores, supermarkets, POS operators, and fashion outlets, which are widely distributed across urban and semi-urban markets. Service-based enterprises, such as salons, logistics firms, ICT centres, and repair services, constitute a significant part of the business ecosystem. Manufacturing activities in Nnewi and Awka include automobile parts production, food processing, footwear, and garment production. Agro-processing businesses engaged in palm oil extraction, cassava processing, and food supply chains further illustrate the structure of indigenous enterprises in the state. These sectoral groupings provide an appropriate context for examining the relationship between e-commerce capability and firm performance.

Population of the Study

The target population comprised indigenous small and medium enterprises operating within Anambra State. However, the study did not seek to cover the entire SME population reported in the 2021 SMEDAN and National Bureau of Statistics (NBS) survey. Rather, the study focused on an accessible population consisting of indigenous SMEs operating within Onitsha, Nnewi, and Awka that actively utilised, or possessed the capacity to utilise, digital marketing, electronic payment systems, and online customer engagement platforms. The accessible population of approximately 2,000 SMEs was established by compiling membership registers obtained from recognised business associations, market associations, SME directories, and organised business clusters across the three commercial centres. The various lists were reviewed to eliminate duplicate business entries before developing the final sampling frame. The resulting accessible population comprised approximately 950 SMEs in Onitsha, 620 SMEs in Nnewi, and 430 SMEs in Awka. To ensure adequate representation, the accessible population was categorised according to business location and major business sector, namely retail, manufacturing, service, and agro-processing enterprises. This categorisation provided a structured sampling frame from which respondents were selected.

Sample Size Determination and Sampling Technique

The sample size is determined using the Yamane (1967) formula for finite populations. With an estimated population of 2,000 indigenous SMEs and a 5% margin of error, the formula

yields a sample size of 333 respondents. To mitigate the effects of non-response and incomplete questionnaires, an additional 10% is included, resulting in an adjusted sample size of 366 respondents. Respondents comprise owners, managers, and key decision-makers of SMEs in the retail, services, manufacturing, and agro-processing sectors. Data are collected using a structured questionnaire administered through both physical and electronic means to ensure comprehensive coverage across Onitsha, Nnewi, and Awka. The instrument captures information on digital marketing capability, electronic payment system capability, online customer engagement capability, and business performance.

Table 1. Population and Sample Distribution

Location	Population	Sample
Onitsha	950	174
Nnewi	620	114
Awka	430	78
Total	2000	366

A stratified sampling technique was adopted to ensure that indigenous SMEs from the major commercial centres and principal business sectors were adequately represented in the study. The accessible population was first stratified according to geographical location, namely Onitsha, Nnewi, and Awka. Within each geographical stratum, businesses were further grouped into four major sectors: retail, manufacturing, service, and agro-processing enterprises. Proportionate allocation was subsequently applied to determine the number of SMEs selected from each stratum based on their relative size within the accessible population.

Following the allocation process, participating SMEs were selected through simple random sampling using the compiled sampling frame. This procedure ensured that each eligible enterprise had an equal probability of being selected while improving the representativeness of the sample. The unit of analysis was the enterprise, while the unit of observation was one knowledgeable representative from each enterprise. Respondents consisted of owners, chief executive officers, managers, or senior decision makers who possessed sufficient knowledge of their firms' digital business practices and overall performance. Only one questionnaire was completed for each enterprise to ensure that each business was represented by a single response.

Research Instrument

Primary data were collected using a structured questionnaire designed to obtain information on the variables investigated in the study. The questionnaire consisted of two sections. Section A elicited demographic information relating to the participating enterprises and respondents, while Section B contained measurement items covering digital marketing capability, electronic payment system capability, online customer engagement capability, and business performance. The measurement items were adapted from validated instruments reported in previous empirical studies on e-commerce capability and SME performance, with minor modifications to reflect the context of indigenous businesses in Anambra State. Responses were measured using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree, with higher scores indicating stronger agreement with each statement.

Validity of the Research Instrument

Content and face validity are employed to establish the validity of the research instrument. Questionnaire items are developed based on existing literature on e-commerce

capability and SME performance to ensure alignment with research objectives and conceptual variables. The instrument is subsequently reviewed by academic experts in entrepreneurship and business management to assess its clarity, relevance, and measurement adequacy. Expert feedback is incorporated to refine ambiguous items and enhance construct representation. This process ensures that the instrument effectively captures digital marketing capability, electronic payment capability, online customer engagement capability, and the performance of indigenous businesses.

Reliability of the Research Instrument

Reliability is assessed using Cronbach's Alpha to determine internal consistency among the measurement items. A pilot study involving 30 indigenous SMEs, selected outside the main sample, is conducted to test the instrument. All constructs record Cronbach's Alpha values above 0.70, indicating acceptable reliability and internal consistency. These results confirm that the instrument is stable and capable of producing consistent outcomes under similar conditions.

Data Collection Procedure

Data were collected through both physical and electronic administration of the questionnaire to improve accessibility and response coverage among participating SMEs. Printed questionnaires were administered through direct visits to selected business premises, markets, and organised business clusters, while electronic questionnaires were distributed through recognised business associations and digital communication platforms commonly used by business owners and managers. To minimise the possibility of duplicate responses, each participating enterprise was represented by only one respondent. Respondents were informed that only one completed questionnaire should be submitted on behalf of each enterprise. Returned questionnaires were screened to identify incomplete responses and verify that each questionnaire represented a unique business entity before inclusion in the final analysis.

Ethical Considerations

Participation in the study was entirely voluntary. Respondents were informed of the purpose of the research before completing the questionnaire and their consent was obtained prior to participation. Participants were assured that information provided would be treated with strict confidentiality and used solely for academic purposes. No personally identifiable information capable of revealing the identity of individual respondents or enterprises was disclosed in the presentation of the findings.

Method of Data Analysis

Collected data are analysed using descriptive and inferential statistical techniques with the aid of the Statistical Package for Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, means, and standard deviations, are used to summarise demographic characteristics and respondents' perceptions of the study variables. Inferential analysis is conducted using multiple regression to determine the effect of e-commerce capability dimensions on the performance of indigenous businesses. Hypotheses are tested at a 5% level of significance, and decisions are based on p-values ($p \leq 0.05$).

Model Specification. The model for this study is specified within a multiple regression framework to examine the relationship between e-commerce capability and the performance of indigenous businesses. The functional and econometric forms are presented as follows:

Business Performance = f (Digital Marketing Capability, Electronic Payment System Capability, Online Customer Engagement Capability)

Econometric model:

$$BP = \beta_0 + \beta_1 DMC + \beta_2 EPSC + \beta_3 OCEC + \mu$$

Where:

BP = Business Performance of Indigenous Businesses

DMC = Digital Marketing Capability

EPSC = Electronic Payment System Capability

OCEC = Online Customer Engagement Capability

β_0 = Constant term

β_1 – β_3 = Coefficients of independent variables

μ = Error term

The model is estimated using multiple regression analysis to determine the individual and combined effects of e-commerce capability dimensions on the performance of indigenous businesses in Anambra State, Nigeria.

RESULTH AND DISCUSSION

A total of 366 questionnaires were distributed to respondents across the selected commercial hubs in Anambra State, namely Onitsha, Nnewi, and Awka. Of these, 341 questionnaires were correctly completed and returned, while the remaining copies were either not returned or improperly completed. The resulting response rate of 93.2% is considered adequate for statistical analysis and generalisation in social science research.

Demographic Profile of Respondents

This section presents the demographic characteristics of respondents involved in the study. The demographic analysis provides contextual understanding of the respondents and establishes the appropriateness of the data for examining the effect of e-commerce capability on the performance of indigenous businesses in Anambra State, Nigeria.

Table 2. Demographic Profile of Respondents (N = 341)

Variable	Category	Frequency	Percentage (%)
Gender	Male	208	61.0
	Female	133	39.0
Age of Respondents	18–25 years	52	15.2
	26–35 years	141	41.3
	36–45 years	102	29.9
	46 years and above	46	13.6
Educational Level	Secondary	47	13.8
	OND/NCE	78	22.9
	Bachelor's Degree	156	45.7
	Postgraduate	60	17.6
Firm Age	1–5 years	126	37.0
	6–10 years	118	34.6
	11 years and above	97	28.4
Business Sector	Retail Trading	152	44.6
	Services	79	23.2
	Manufacturing	68	19.9
	Agro-processing	42	12.3

Gender Distribution

The findings reveal that 61.0% of respondents are male and 39.0% are female, indicating male dominance in indigenous business ownership and management in Anambra State. This

pattern reflects the prevailing entrepreneurial structure in many developing economies, where men continue to dominate commercial activities despite increasing female participation in SMEs and digital entrepreneurship.

Age Distribution of Respondents

The age distribution indicates that respondents aged 26–35 years constituted the largest proportion of the sample (41.3%), followed by those aged 36–45 years (29.9%). Respondents aged 18–25 years accounted for 15.2%, while those aged 46 years and above represented 13.6% of the sample. The results indicate that the respondents were drawn from a broad range of age groups, thereby providing perspectives from SME decision makers at different stages of their professional and business experience. No inference is made regarding differences in technological adaptability because such relationships were not examined in this study.

Educational Qualification

The educational profile shows that 45.7% of respondents possessed a bachelor's degree, 22.9% held OND or NCE qualifications, 17.6% had postgraduate qualifications, and 13.8% possessed secondary school qualifications. These findings indicate that respondents represented different educational backgrounds. However, educational attainment alone should not be interpreted as evidence of digital competence, as the study did not investigate the relationship between educational qualification and digital capability.

Firm Age and Business Sector

The results show that 37.0% of businesses have operated for 1–5 years, 34.6% for 6–10 years, and 28.4% for more than 11 years. This distribution indicates that the study captured both emerging and relatively established indigenous enterprises. Businesses in these age categories are more likely to pursue strategic initiatives to improve competitiveness, customer reach, and operational performance through digital technologies. The sectoral distribution indicates that retail trading businesses are the most dominant (44.6%), followed by service-based enterprises (23.2%), manufacturing firms (19.9%), and agro-processing businesses (12.3%). This reflects the commercial structure of Anambra State, particularly the influence of major trading centres such as Onitsha and Nnewi. The demographic profile confirms that the respondents are suitable for examining the relationship between e-commerce capability and the performance of indigenous businesses in Anambra State.

Descriptive Statistics of Study Variables

The study variables were measured on a 5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

Table 3. Descriptive Statistics

Variable	Items	Mean	Std. Deviation	Interpretation
Digital Marketing Capability (DMC)	5	3.91	0.73	High
Electronic Payment System Capability (EPSC)	5	3.84	0.77	High
Online Customer Engagement Capability (OCEC)	5	3.79	0.81	High
Business Performance (BP)	5	3.88	0.75	High

The descriptive statistics indicate that Digital Marketing Capability recorded a mean score of 3.91 (SD = 0.73), Electronic Payment System Capability recorded a mean score of 3.84 (SD = 0.77), Online Customer Engagement Capability recorded a mean score of 3.79 (SD = 0.81), while Business Performance recorded a mean score of 3.88 (SD = 0.75). Based on the established decision rule, all four constructs fall within the high category. The relatively small

standard deviation values suggest that respondents' opinions were reasonably consistent across the measured constructs.

Regression Analysis (Hypothesis Testing)

Restatement of Study Hypotheses

H₀₁: Digital marketing capability has no significant effect on the performance of indigenous businesses in Anambra State, Nigeria.

H₀₂: Electronic payment system capability has no significant effect on the performance of indigenous businesses in Anambra State, Nigeria.

H₀₃: Online customer engagement capability has no significant effect on the performance of indigenous businesses in Anambra State, Nigeria.

Table 4. Model Summary

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate
1	0.807	0.651	0.648	0.366

The model summary indicates a strong positive relationship ($R = 0.807$) between the combined dimensions of e-commerce capability and the performance of indigenous businesses in Anambra State. The coefficient of determination ($R^2 = 0.651$) indicates that 65.1% of the variation in business performance is jointly explained by digital marketing capability, electronic payment system capability, and online customer engagement capability. The adjusted coefficient of determination (Adjusted $R^2 = 0.648$) shows that, after adjusting for the number of predictors in the model, approximately 64.8% of the variation in business performance remains explained. The remaining 34.9% of the variation may be attributed to factors outside the scope of the present study. Overall, the model demonstrates substantial explanatory power, suggesting that e-commerce capability is an important determinant of indigenous business performance.

Table 6. ANOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	84.317	3	28.106	209.75	<0.001
Residual	45.168	337	0.134		
Total	129.485	340			

The ANOVA results indicate that the overall regression model is statistically significant ($F = 209.75$, $p < 0.001$). This finding demonstrates that digital marketing capability, electronic payment system capability, and online customer engagement capability jointly explain a significant proportion of the variation in the performance of indigenous businesses in Anambra State. Consequently, the null proposition that the explanatory variables have no joint predictive effect on business performance is rejected. The significance of the overall model confirms that the regression equation provides a meaningful basis for predicting business performance from the selected dimensions of e-commerce capability.

Table 7. Regression Coefficients

Variable	Unstandardized B	t	Sig.	Decision
Constant	0.794	5.120	<0.001	—
Digital Marketing Capability	0.338	7.440	<0.001	Reject H ₀₁
Electronic Payment System Capability	0.291	6.260	<0.001	Reject H ₀₂
Online Customer Engagement Capability	0.254	5.810	<0.001	Reject H ₀₃

The regression coefficients indicate that each dimension of e-commerce capability exerts a positive and statistically significant effect on the performance of indigenous businesses in Anambra State.

Digital marketing capability has a positive and statistically significant effect on business performance ($B = 0.338$, $t = 7.440$, $p < 0.001$). This implies that an improvement in digital marketing capability is associated with an increase in business performance. Therefore, the null hypothesis (H_01) is rejected.

Electronic payment system capability also has a positive and statistically significant effect on business performance ($B = 0.291$, $t = 6.260$, $p < 0.001$). This finding indicates that businesses with stronger electronic payment capabilities are more likely to achieve improved organisational performance. Accordingly, the null hypothesis (H_02) is rejected.

Similarly, online customer engagement capability has a positive and statistically significant effect on business performance ($B = 0.254$, $t = 5.810$, $p < 0.001$). This suggests that effective customer interaction through digital platforms contributes significantly to improved business performance. Consequently, the null hypothesis (H_03) is rejected.

The positive coefficients obtained for all three explanatory variables demonstrate that improvements in e-commerce capability are associated with corresponding improvements in business performance. However, because only the unstandardized regression coefficients (B) are available, the relative contribution of each predictor cannot be established conclusively. Determining the strongest predictor requires the standardised beta (β) coefficients from the original regression output. While the regression model demonstrated strong explanatory power, the absence of the original SPSS coefficients output prevented the reporting of additional regression diagnostics such as standardised beta coefficients, confidence intervals, and collinearity statistics. Consequently, the relative contribution of the predictors and formal assessment of multicollinearity could not be undertaken.

Discussion of Findings

The study found that digital marketing capability has a significant positive effect on the performance of indigenous businesses in Anambra State. This finding is consistent with Al-Adwan et al. (2022), who reported that digital marketing capability significantly enhances firm performance, and Nuseir and El Refae (2021), who found that digital marketing contributes positively to business growth and competitiveness among SMEs. The finding also agrees with Afolayan et al. (2015), who reported that the adoption of digital marketing strategies significantly improved the performance of Nigerian SMEs. The result suggests that strengthening digital marketing capability contributes positively to the performance of indigenous businesses.

The study also found that electronic payment system capability has a significant positive effect on the performance of indigenous businesses in Anambra State. This finding corroborates Demirgüç-Kunt et al. (2022), who reported that digital payment adoption improves business performance. The result indicates that businesses with stronger electronic payment capabilities are more likely to achieve improved performance.

The study further revealed that online customer engagement capability has a significant positive effect on the performance of indigenous businesses. This finding is in agreement with Harrigan et al. (2021), who found that online customer engagement contributes positively to organisational performance, and Chatterjee et al. (2022), who reported that effective digital interaction with customers enhances business performance. The finding implies that businesses that actively engage customers through online platforms are more likely to improve their overall performance.

Overall, the regression analysis showed that the three dimensions of e-commerce capability jointly explained 65.1% of the variation in the performance of indigenous businesses in Anambra State. This indicates that e-commerce capability is an important determinant of business performance. The finding further suggests that improving digital marketing capability, electronic payment system capability, and online customer engagement capability can contribute significantly to enhancing the performance of indigenous businesses in the study area.

CONCLUSION

The study examined the effect of e-commerce capability on the performance of indigenous businesses in Anambra State, Nigeria, with a specific focus on digital marketing capability, electronic payment system capability, and online customer engagement capability. The findings indicate that all three dimensions of e-commerce capability have significant positive effects on business performance. This suggests that indigenous businesses with stronger digital marketing capability, more effective electronic payment systems, and better online customer engagement capability tend to report higher levels of business performance. The study further demonstrates that e-commerce capability is an important predictor of the performance of indigenous businesses in Anambra State. The findings underscore the relevance of investing in digital capabilities to enhance business performance in an increasingly digital business environment. However, given the cross-sectional nature of the study and the reliance on self-reported data, the findings should be interpreted as evidence of significant statistical relationships rather than definitive causal effects. Consequently, the study concludes that strengthening e-commerce capability is associated with improved business performance among indigenous businesses in the study area. Based on the findings, the following recommendations are proposed:

1. Adoption of advanced digital marketing strategies: Indigenous businesses should intensify the use of digital marketing platforms such as social media advertising, search engine marketing, and online branding strategies to improve customer reach, visibility, and sales performance.
2. Strengthening electronic payment infrastructure: Business owners should adopt secure and efficient electronic payment systems to improve transaction convenience, reduce operational delays, and enhance customer satisfaction. Government and financial institutions should also support SMEs with affordable digital payment solutions.
3. Enhancement of online customer engagement systems: Businesses should establish active online communication channels through social media platforms, messaging applications, and customer feedback systems to improve customer relationships, responsiveness, and loyalty.
4. Provision of digital entrepreneurship training: Government agencies, business associations, and entrepreneurial support institutions should organise training programmes that equip indigenous business owners with practical skills in e-commerce management, digital marketing, and online customer relationship management.
5. Improvement of digital infrastructure: There is a need for improved internet accessibility, stable electricity supply, and affordable digital technologies to encourage broader adoption of e-commerce practices among indigenous businesses in Anambra State.

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STRATEGIC COGNITION AND SPORT TOURISM DEVELOPMENT IN SAUDI ARABIA: AN INTEGRATIVE CONCEPTUAL FRAMEWORK

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ABSTRACT

The development of Saudi Arabia's sports tourism is increasingly important in supporting economic diversification through Saudi Vision 2030. However, previous literature still tends to discuss investments, destination competitiveness, imagery, stakeholder support, and legacy events separately, while the cognitive mechanisms that translate vision into outcomes have not been adequately explained. This research aims to develop an integrative conceptual framework that connects strategic attention, interpretation, reframing, collective sensemaking, organizational learning, resource mobilization, stakeholder coordination, destination competitiveness, and event legacy. The method used was an integrative-conceptual literature review of 47 selected articles from Scopus for the period 2019 until April 2026 as well as foundational works, which were analyzed descriptively, thematically, and conceptually. The results of the study resulted in a micro–meso–macro multilevel model and six propositions that affirm that vision and investment do not automatically lead to destination success. Success depends on the quality of cognitive, institutional, implementation, barrier control, and adaptive learning translation. This framework expands the application of Cognitive School to the transformation of national destinations and provides an empirical validation agenda.

Keywords: Strategic Cognition; Sports Tourism; Collective Sensemaking; Legacy Event

INTRODUCTION

In an open economic system, comparative advantage only becomes a competitive advantage when resources are able to be managed, combined, and directed to create value. In tourism, natural resources, culture, geographical location, and funding capacity require support for infrastructure, connectivity, services, human resources, and effective governance (Farida & Setiawan, 2022; Krugman et al., 2022). Therefore, the success of a destination is not enough to judge by the number of visits, but by its ability to build a competitive, inclusive, and sustainable ecosystem.

Saudi Arabia has historically been known as a religious tourism destination, but Saudi Vision 2030 is expanding its portfolio into cultural, nature, entertainment, and sports tourism. By 2025, the country will record around 123 million domestic and foreign tourists with an expenditure of around SAR304 billion; 29.3 million of them are international tourists (Ministry of Tourism, 2026). This development shows a change in the structure of tourism as well as the increasing ambition of Saudi Arabia to build a global destination.

Sports tourism is one of the important instruments of this transformation through the implementation of Formula 1, boxing, golf, football, marathons, and electronic sports. International-scale events can increase visits, spending, connectivity, regional regeneration, employment, and destination image. However, these benefits are accompanied by the risk of congestion, environmental pressure, price increases, fiscal burdens, economic leakage, and low utilization of facilities after the event. Therefore, sports investments need to be assessed based on net social benefits, opportunity costs, integration with local economies, and the sustainability of legacy events, not just the number of events or media exposure (Bazzanella et al., 2023; Knott, 2021).

Saudi Vision 2030 puts sports and tourism within the framework of economic diversification, improving the quality of life, community development, and strengthening institutional capacity. Programs such as the Quality of Life Program, Public Investment Fund Program, Qiddiya, and Sports Boulevard show that these policies are strategic portfolios that connect destinations, transportation, accommodation, human resources, the private sector, and communities. Sports investment is also used as an instrument of sports diplomacy, soft power, and national image formation. However, international news and sportswashing criticism show that visibility does not automatically result in legitimacy or a positive reputation (Almahraj, 2023; Skey, 2023).

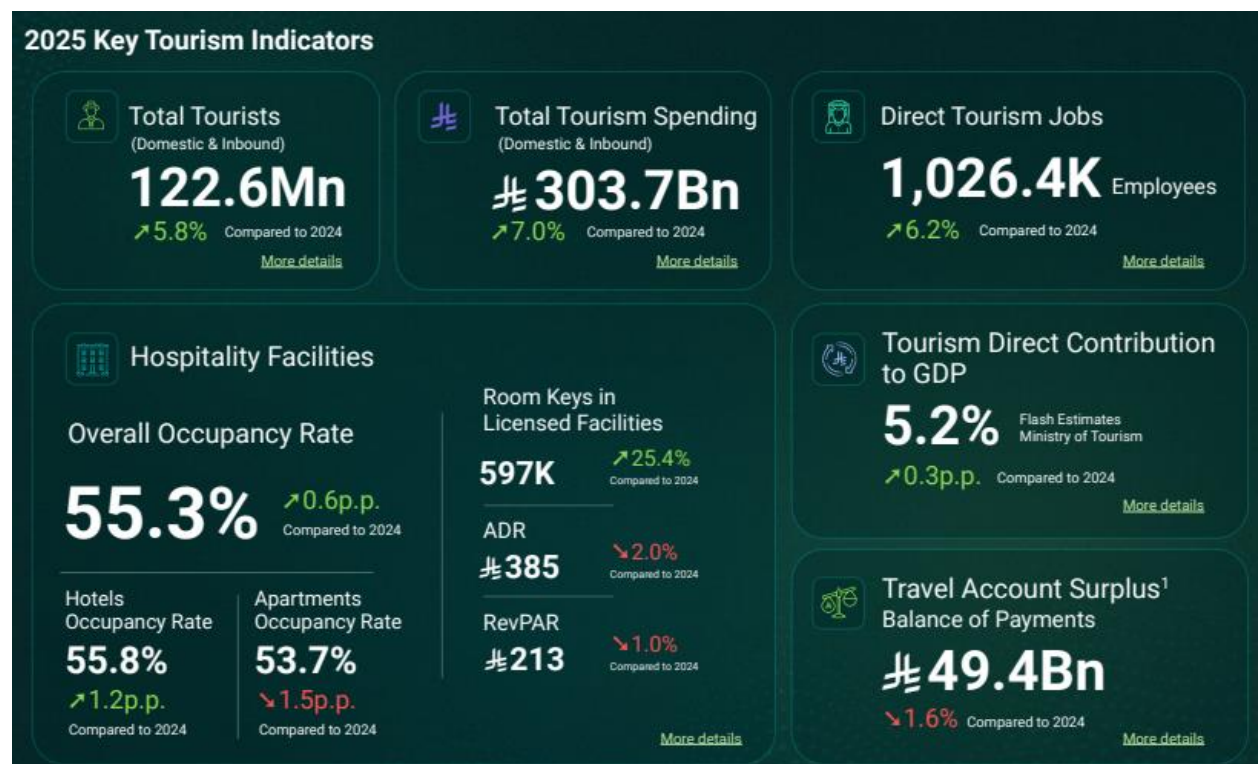


Figure 1. Key Tourism Indicators

Such complexity requires a perspective that explains not only the resources and outcomes, but also the cognitive processes that shape the strategy. Cognitive School views strategy as a mental construct that is influenced by perception, experience, intuition, learning, and interpretation. In the context of Saudi Arabia, this perspective helps explain how diversification opportunities gain strategic attention, are interpreted as opportunities, and are reframing into sports investment policies. The translation of the vision further relies on collective sensemaking, organizational learning, inter-agency coordination, and stakeholder involvement (Luoma & Martela, 2021; Mollah et al., 2021).

The research gap lies in the limited studies that integrate strategic cognition with the development of sports tourism at the national level. Previous literature has tended to discuss destination competitiveness, event legacy, image, stakeholder support, and sustainability separately, while the roles of strategic attention, interpretation, reframing, and sensemaking have not been adequately explained. This research aims to develop a conceptual model that connects these cognitive processes with organizational learning, resource mobilization, stakeholder coordination, implementation quality, destination competitiveness, and event legacy. The novelty lies in the explanation of the micro-meso-macro mechanism that translates vision and investment into destination results.

LITERATURE REVIEW

Cognitive School in Strategy Formation

The Cognitive School views strategy not solely as the result of rational planning, but as a mental representation formed through the perceptions, experiences, beliefs, and interpretations of decision-makers (Mintzberg, 2020). Environmental information is selected into schemas and frameworks that influence action choices. This perspective is powerful in

explaining the formation of meaning, but mental processes are difficult to observe directly and are susceptible to heuristics, selective attention, confirmation bias, and pre-formed beliefs (Hodgkinson et al., 2023). In this article, the Cognitive School becomes a theoretical orientation; strategic cognition refers to attention, interpretation, and framing; Meanwhile, managerial cognition explains the process to individuals and groups of decision-makers. In Saudi Vision 2030, economic conditions, market opportunities, and resources do not automatically determine the direction of policy. Information about dependence on oil, the development of the global sports industry, changes in tourist preferences, investment opportunities, and the need to strengthen the country's image first pass strategic attention. The information is then interpreted and reframed as opportunities for economic diversification, destination development, and social transformation. The Cognitive School is used as an analytical lens, not as a claim that Saudi Arabian policymakers explicitly use Mintzberg's thinking.

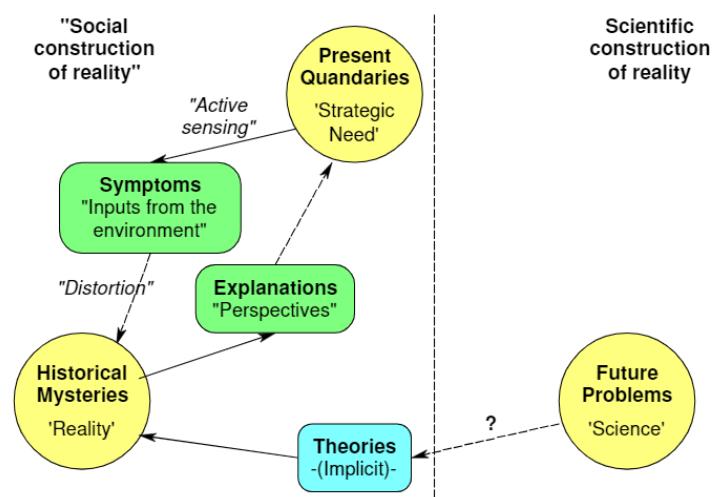


Figure 2. Cognitive School Knowledge Network

Functions of Supporting Theories

Economic theory, Resource-Based View, dynamic capabilities, and stakeholder theory are used as supporting perspectives. Economic theory describes the potential multiplier effect, externalities, opportunity costs, and macro consequences. However, the increase in visitors has not proven a causal relationship with growth as the impact depends on length of stay, additional expenditure, local content, domestic supplier capacity, benefit distribution, and import leakage (Özer et al., 2022; Barandela et al., 2022). The evaluation also needs to include water and energy pressure, emissions, waste, congestion, fiscal burden, and utilization of post-event facilities. The integration of supporting theories is not intended to build infinite eclecticism. Each perspective has a specific function in the order of explanation: economics and institutions provide context, cognition explains the formation of choices, sensemaking translates choices into collective understanding, RBV and dynamic capabilities explain capacity development, while stakeholder theory explains the coordination and distribution of influence. This division of functions maintains parsimony while preventing overlapping concepts.

RBV explains resources that can support the excellence of destinations, such as sports infrastructure, capital, connectivity, technology, data, hosting rights, cultural heritage, and international networks. Strategic value only emerges when these resources are combined with

marketing capabilities, event management, security, tourist services, workforce development, and institutional coordination (Moradi et al., 2022). Because destination resources are scattered among governments, investors, event organizers, airlines, hotels, federations, communities, and local businesses, resource mobilization is an economic, social, and cognitive process, not just asset ownership.

Dynamic capabilities describe updating resources through sensing, seizing, and transforming. Sensing includes the ability to recognize changes in demand, technology, and sustainability risks; seizing includes investment allocation and partnership formation; Meanwhile, transforming includes regulatory reform, workforce development, and the integration of sports with the tourism ecosystem. Cognitive School provides a micro-foundation because sensing abilities are influenced by what gets attention and how information is framed, while dynamic capabilities explain interpreting translation into resource and institutional changes (Murray et al., 2022).

Stakeholder theory describes coordination among governments, destination management organizations, sports federations, investors, airlines, hotels, local businesses, communities, media, and tourists. Collaboration requires clear goals, role sharing, knowledge exchange, trust, and conflict resolution. However, collective sensemaking is not always harmonious because actors have different authority, legitimacy, information, resources, and bargaining capacity. Therefore, collective meaning needs to be understood as a negotiation process that can involve domination and marginalization.

Micro–Meso–Macro Mechanisms

The model uses three levels of analysis. At the micro level, strategic attention, interpretation, and reframing shape the way decision-makers understand opportunities and risks. At the meso level, interpretation is communicated, negotiated, and codified through collective sensemaking, organizational learning, resource mobilization, capability development, and coordination. At the macro level, translation quality results in destination competitiveness, event legacy, reputation, local business development, employment, social legitimacy, and sustainability. Interlevel relationships are bidirectional: communication and institutionalization connect micro–meso; services, product integration, labor, and benefit distribution connect meso–macro; Meanwhile, the evaluation of results flows back through knowledge renewal and reframing. The multilevel approach also avoids the mistake of directly linking a leader's cognition to national outcomes. Micro-influences towards meso take place through communication, policy documents, budget decisions, and routines; The influence of MESO towards macro takes place through service quality, destination products, workforce development, and benefit distribution. In contrast, macro outcomes only affect cognition when they are collected, interpreted, and reincorporated into organizational processes.

Saudi Arabia's Sports Tourism Context

The context of Saudi Arabia shows that sport has been reframing from recreational activities to economic assets, tourism products, instruments of diplomacy, and drivers of social transformation. However, attention to the number of events, investments, visitors, and exposure can override fiscal costs, benefit distribution, community revenue, and environmental impacts. Community support in Riyadh and Al-Juhfa also depends on benefits, costs, economic access, control over local resources, and the protection of social values and cultural heritage (Algassim et al., 2023). International reputation also depends on consistency between communication, the traveller experience, governance transparency, and verifiable social-environmental practices.

Large investments and long-term commitments can create institutional lock-in when strategies are embedded in contracts, budgets, infrastructure, routines, and success narratives. Under these conditions, evidence of rising costs, low facility utilization, economic leakage, or environmental pressures does not necessarily result in policy corrections. Therefore, the development of sports tourism requires independent evaluation, openness to alternatives, scenario analysis, periodic review, and learning mechanisms that test dominant assumptions (Simoens et al., 2022).

Table 1. Definition and Position of Constructs in Conceptual Models

Construct	Conceptual definition	Analysis level	Roles in models	Key references
<i>Strategic attention</i>	The process of selecting issues and information that gains the focus of decision-makers in complex situations	Micro	Early cognitive mechanisms	(Hodgkinson et al., 2023)
<i>Interpretation</i>	The process of giving meaning to information, opportunities, and strategic threats	Micro	Mechanism of interpretation	(Luoma & Martela, 2021)
<i>Reframing</i>	Changes in the framework used to understand a problem or opportunity so as to result in different alternative strategies	Micro	Reframing mechanism	(Luoma & Martela, 2021)
<i>Collective sensemaking</i>	The process of communication, negotiation, and the formation of mutual understanding among stakeholders	Meso	Social translation mechanism	(Mollah et al., 2021)
Organizational learning	The process of turning experience and knowledge into procedures, routines, and policy adjustments	Meso and feedback	Institutionalization and adaptation	(Mollah et al., 2021)
Resource mobilization	The process of identifying, allocating and combining resources to execute the strategy	Meso	Implementation mechanism	(Moradi et al., 2022)
<i>Dynamic capabilities</i>	Ability to recognize opportunities, make decisions, and transform resources through <i>sensing</i> , <i>seizing</i> , and <i>transforming</i>	Meso	Capability development	(Murray et al., 2022)
Stakeholder coordination	The process of aligning goals, roles, information, and resources between actors	Meso	Collective implementation mechanism	(Mollah et al., 2021)

Quality of implementation	The level of integration of sporting events with services, supply chains, labor, people, and destination products	Meat-macro	Connecting to results	(Bazzanella et al., 2023)
<i>Destination competitiveness</i>	The ability of destinations to create valuable experiences, maintain demand, and build relative superiority	Macro	Strategic results	(Moradi et al., 2022)
<i>Event legacy</i>	Long-term benefits and consequences that persist after the event ends	Macro	Long-term results	(Bazzanella et al., 2023)
Barriers to strategy translation	Cognitive and institutional barriers that reduce the quality of strategy translation	Cross-level	Inhibiting factors	(Hodgkinson et al., 2023)
<i>Institutional lock-in</i>	Conditions when strategies are difficult to correct because they are embedded in investments, contracts, routines, and political commitments	Meat-macro	Feedback inhibitors	(Simoens et al., 2022)

RESEARCH METHOD

This study uses an integrative-conceptual literature review to synthesize the literature on strategic cognition, Cognitive School, strategic management, sports tourism, destination development, and Saudi Vision 2030. Literature was searched through Scopus for the period 2019 to April 2026, while foundational works were identified through citation searches. Keywords include strategic cognition, managerial cognition, strategic attention, reframing, sensemaking, sport tourism, destination competitiveness, event legacy, and Saudi Vision 2030. Articles are selected based on the relevance of the construct or context, the availability of the full text, and the credibility of the source; Policy documents are used to explain context, not to deduce mental processes or causal relationships.

An initial search yielded 1,237 documents; After the deletion of duplicates there are 1,227 documents left. A total of 293 articles were filtered by titles and abstracts, 50 were assessed in full, and 47 were included in the final synthesis. Data are extracted based on theory, design, level of analysis, constructs, findings, and limitations. The analysis is carried out descriptively, thematically, and conceptually through deductive coding and iterative refinement of the theme. The results were used to construct micro–meso–macro mechanisms and six propositions that require empirical validation.

RESULTS AND DISCUSSION

The results of the synthesis show that the development of Saudi Arabia's sports tourism cannot be explained through the direct relationship between economic conditions, investments,

events, and destination outcomes. Economic theory explains potential benefits and externalities; RBV identifies resources; dynamic capabilities describes capability updates; While stakeholder theory explains the coordination and distribution of influence. However, this perspective does not fully explain how opportunities gain attention, interpret and translate into institutional action. This article places the Cognitive School as the main framework and develops the architecture of strategy translation through cognitive, social, and institutional mechanisms.

The model works on three levels. Economic and institutional conditions are processed at the micro level through strategic attention, interpretation, and reframing. At the meso level, cognitive outcomes are translated through collective sensemaking, organizational learning, resource mobilization, dynamic capabilities, and stakeholder coordination. The quality of implementation then links that capacity to destination competitiveness, event legacy, and sustainability at the macro level. Macro results are back into input through evaluation, knowledge updates, bias correction, and strategy adjustments.

Table 2. Synthesis of Literature Streams and Position of Article Contributions

Literature Flow	Dominant Focus	Main Explanations	Limitations Found	The Mechanism That the Article Offers	Related Propositions
Tourism economy	Investments, demand, and multiplier effects	Explain the potential macroeconomic benefits	Lack of explanation for why an opportunity is given priority	<i>Strategic attention, interpretation, dan reframing</i>	P1
<i>Strategic cognition</i>	Perception and formation of strategy choices	Explain the selection and meaning of information	More frequent stops at the individual or organizational level	Micro-meso translation through <i>collective sensemaking</i>	P1–P2
RBV	Strength-building resources	Describe the strategic resources of the destination	Lack of explanation of how resources are selected and integrated	Mobilization of resources and implementation capacity	P3–P4
<i>Dynamic capabilities</i>	<i>Sensing, seizing, dan transforming</i>	Describe resource adaptation and transformation	The cognitive foundations and institutionalization process have not always been explicit	Cognition as a microfoundation and learning as a link	P3 and P6
Stakeholder theory	Collaboration and coordination	Explain collective action	Collaboration is often seen as too harmonious	<i>Collective sensemaking</i> , power, and distribution of influence	P2, P3, and P5
<i>Event legacy</i>	Long-term impact of the event	Explain the post-event results	Inheritance is often treated as the end result	Quality of implementation and feedback-based learning	P4 and P6

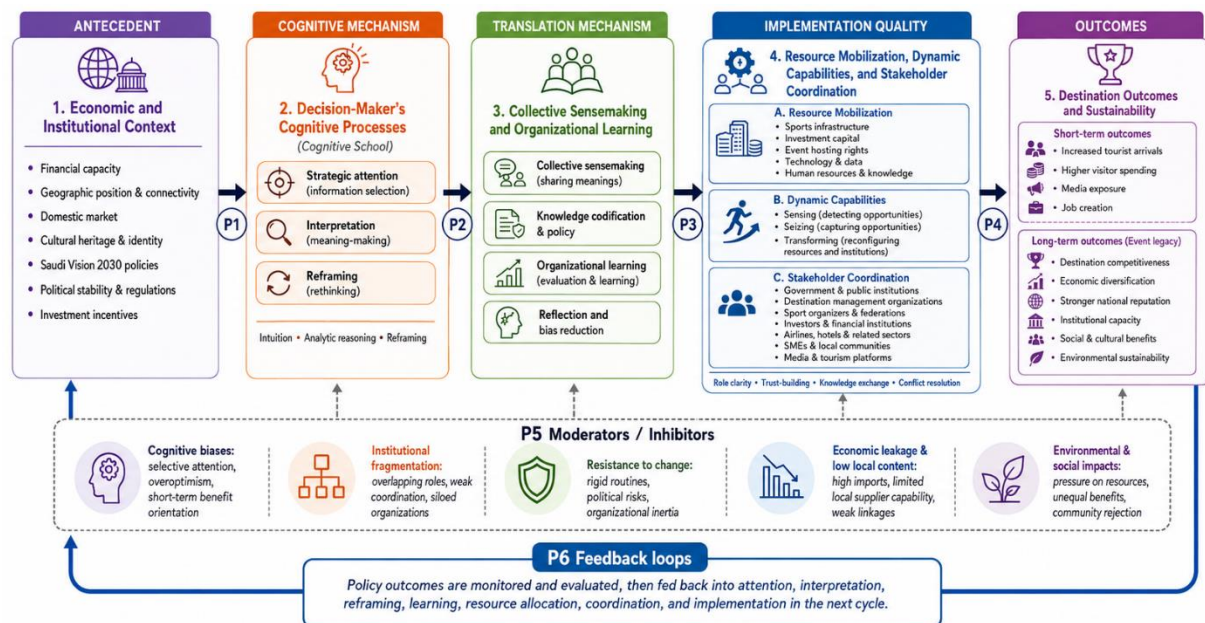


Figure 3. Conceptual Framework of Strategic Cognition and Sport Tourism Development

Proposition 1: Economic and Institutional Conditions as Inputs for Strategic Cognitive Processes

Saudi Arabia's conditions, such as its historical dependence on oil, the country's financing capacity, connectivity, domestic markets, cultural heritage, the economy of experiences, and Saudi Vision 2030, provide opportunities for diversification as well as destination development. However, these conditions do not determine priorities directly. New opportunities have strategic consequences when they gain attention and are considered relevant by decision-makers. Strategic attention selects information on the growth of the sports market, changing tourist preferences, destination competition, non-oil revenue generation, and international exposure. Interpretation gives meaning as an opportunity or a threat, while reframing transforms sports from a recreational activity into an industry, a tourism product, an instrument of diplomacy, and a driver of social transformation. Due to limited attention capacity, visible indicators can dominate life-cycle costs, economic leakage, benefit distribution, and socio-environmental pressures (Hodgkinson et al., 2023; Luoma & Martela, 2021). The placement of conditions as antecedents also prevents the model from making deterministic claims that financial capacity or geographical position by itself generates investment decisions. Two countries may face similar opportunities, but choose different responses because the attention, experience, beliefs, and indicators used are not the same. In the context of public policy, this process also determines which sectors are prioritized, the type of events chosen, the scale of investment, the form of partnership, and the balance between economic, social, and reputational goals. Thus, the quality of the strategy starts from the quality of selection and interpretation of information before resources are allocated.

P1: Economic and institutional conditions shape sports tourism strategies through their influence on strategic attention, interpretation, and reframing of decision-makers.

Proposition 2: Translating Strategic Cognition into Collective Sensemaking

Individual or group interpretations do not automatically become national policy because strategies involve organizations with different mandates, knowledge, resources, and interests. Collective sensemaking becomes a micro-meso mechanism when strategic frames are

communicated, negotiated, and codified through coordination meetings, working groups, data exchanges, policy documents, indicators, and responsibility sharing. This process forms a common language as well as priorities, but it is not always neutral. Actors who control regulation, funding, legitimacy, and information can better determine the goals and measures of success, while communities and small businesses have limited influence. Collective sensemaking is therefore distinguished from coordination: the former forms a shared understanding, while the latter aligns actions once an understanding begins to form (Mollah et al., 2021; Murray et al., 2022). In practice, the formation of mutual understanding can take place through the preparation of cross-agency plans, destination planning forums, event evaluations, and alignment of performance indicators. The mechanism is important because terms such as success, event heritage, local content, or sustainability can be interpreted differently by ministries, investors, organizers, local governments, and communities. Misunderstandings of meaning can result in overlapping programs, conflicts of priorities, and operational successes that are not in line with destination development goals. Therefore, the quality of sensemaking needs to be assessed from the disclosure of information, representation of actors, the ability to convey alternative views, and the clarity of the relationship between national goals and organizational actions.

P2: Articulation and communication of strategic frames encourage the formation of collective sensemaking among organizations involved in the development of sports tourism.

Proposition 3: Institutionalizing Understanding through Learning and Implementation Capacity

A common understanding is not enough if it is not translated into procedures, budgets, division of roles, and capabilities. Organizational learning transforms experience and knowledge into indicators, policies, routines, and coordination structures. In the feedforward stage, learning connects collective sensemaking with institutional implementation capacity which includes resource mobilization, capability development, and coordination. Within destinations, resources are spread across many organizations so they need to be identified, allocated, and combined. Dynamic capabilities support this process through sensing for change, seizing through investments and partnerships, and transforming through regulatory updates, human resources, and industrial ecosystems (Murray et al., 2022). Learning at this stage demands more than just experiential documentation. Knowledge needs to be disseminated across organizations, translated into budget decisions, service standards, data systems, workforce competencies, and accountability mechanisms. Net partnering, net visioning, and net orchestration are relevant because no one actor controls all of the destination's resources. Implementation capacity also needs to be dynamic so that organizations can change event portfolios, facility configurations, marketing strategies, and procurement patterns as demand or risk changes. Without such institutionalization, a shared understanding risks ceasing as a normative vision that does not result in operational change.

P3: Collective sensemaking institutionalized through organizational learning increases the capacity of institutional implementation which includes resource mobilization, capability development, and stakeholder coordination.

Proposition 4: Quality of Implementation and Destination Outcomes

Investment, facilities, technology, and hosting rights do not automatically result in competitiveness and legacy events. Strategic value is formed when events are integrated with transportation, accommodation, culture, culinary, entertainment, technology, security, service, local supply chains, and post-event programs. The quality of implementation also includes

workforce development, knowledge transfer, MSME access, local content, distribution of expenses, and utilization of facilities. Therefore, the operational success of the event needs to be distinguished from the success of the destination. Destination competitiveness includes accessibility, safety, quality of facilities and services, reputation, local identity, and the ability to sustain demand; Event legacy includes facility utilization, skills, institutional capacity, local ventures, sports participation, reputation, and long-term socio-environmental benefits (Bazzanella et al., 2023; Knott, 2021). The important implication is that performance measurement must differentiate between outputs, outcomes, and legacy. Outputs include the number of events, attendees, tickets, and exposure; Outcomes include additional expenses, length of stay, satisfaction, employment, and business activities; While legacy includes capabilities, reputation, behavior change, facility utilization, and lasting social-environmental benefits. This distinction helps prevent claims that successful implementation automatically equals successful development. Heritage planning should also begin before the event through the design of multifunctional facilities, local procurement strategies, knowledge transfer programs, event calendar development, and post-event use plans.

P4: Resource mobilization and stakeholder coordination improve destination competitiveness and event legacy through quality implementation that integrates sports events with the tourism ecosystem and local economy.

Proposition 5: Cognitive and Institutional Barriers

The translation of strategies can be weakened by cognitive and institutional barriers. Selective attention, availability bias, confirmation bias, and managerial overconfidence narrow the information under consideration and encourage overly optimistic estimates of demand, cost, and benefit. Fragmentation of authority, power inequality, conflicts of interest, resistance, and institutional lock-in hinder coordination and policy correction. The two groups of barriers can reinforce each other when indicators of events, visits, and exposures are embedded in targets, budgets, contracts, and success narratives. As a result, information regarding life-cycle costs, environmental pressures, benefit distribution, or low facility utilization may be available but not gain attention or result in no change (Hodgkinson et al., 2023; Simoens et al., 2022). Institutional barriers can also transform the participation process into mere formal consultation without substantive influence. When dominant actors control data, funding, and indicators, information that differs from the official narrative can be overlooked. Lock-ins are even stronger when the termination or change of the project incurs high political, reputational, and financial costs. Therefore, the model places the barrier as a cross-level condition, rather than a single variable. Distinguishing between cognitive and institutional barriers is important so that solutions are not only directed at improving individual capabilities, but also at improving authority structures, data transparency, evaluation design, and accountability mechanisms.

P5: Cognitive and institutional barriers weaken the relationship between cognitive processes, collective sensemaking, implementation quality, and sports tourism development outcomes.

Proposition 6: Organizational Learning as Feedback and Adaptation

The development of sports tourism is a cyclical process. Implementation produces information on visits, expenses, use of facilities, local business involvement, quality of work, public perception, reputation, and environmental impact. Learning has a feedforward function when understanding is institutionalized into action and a feedback function when results are used to correct assumptions, attention, interpretation, reframing, resource allocation, coordination, and implementation quality. The mechanisms include post-event evaluation, sports tourism statistics, knowledge repositories, data exchange, scenario analysis, independent reviews, and red teams. However, learning requires data openness, evaluation independence,

stakeholder engagement, and the ability to acknowledge results that do not meet expectations so that information is not used selectively to maintain a narrative of success (Murray et al., 2022). Effective feedback requires consistent indicators across agencies and are available throughout the event cycle. The data must distinguish tourists from local visitors, new spending from expenses that are simply moving, temporary jobs from increased labor capacity, as well as media exposure from changing reputations. The evaluation also needs to compare the results with the initial targets, opportunity costs, and policy alternatives. In this way, failure is not only seen as an operational problem, but as a source of knowledge to improve strategic attention, update demand assumptions, change investment portfolios, and design more realistic and inclusive legacy events.

P6: Organizational learning from implementation results strengthens strategy adaptation through assumption correction, knowledge update, resource allocation adjustments, and policy reframing in the next period.

Theoretically, the model extends the use of the Cognitive School from the context of individual and organizational decisions towards the transformation of national destinations. Its contribution lies in cross-level mechanisms that link cognition, collective meaning, learning, implementation capacity, and destination outcomes; the distinction between the success of the event and the success of the destination; as well as the placement of obstacles and learning as elements that make the model dynamic.

CONCLUSION

This research confirms that the success of Saudi Arabia's sports tourism does not depend directly on Saudi Vision 2030, investment, infrastructure, or the ability to host international events. These conditions provide opportunities and resources, but the results depend on the ability of decision-makers and institutions to select information, give meaning, and reframing, then translate it into collective sensemaking, learning, resource mobilization, capabilities, coordination, and integrated implementation. The theoretical contribution of the research lies in a multilevel model that links strategic cognition at the micro level, institutional translation at the meso level, and destination outcomes at the macro level. Six propositions explain the formation of strategic cognition, collective meaning, institutionalization through learning, the role of implementation quality, the influence of cognitive and institutional barriers, and adaptive feedback. The model expands the Cognitive School from individual and organizational decision-making to the transformation of national destinations. Practically, sports tourism needs to be managed as a destination development portfolio. Governments and related organizations need to align goals and indicators, connect events with local services and supply chains, develop the workforce, expand access to MSMEs, and plan legacy events from the event selection stage. Evaluations must move beyond the number of events, investments, visitors, and exposures by considering local content, distribution of benefits, life-cycle costs, community revenue, socio-environmental impact, and facility utilization. Independent evaluations, cross-agency data systems, scenario analysis, and post-event reviews are necessary to reduce bias and institutional lock-in. The limitations of the study stem from its integrative-conceptual nature so that the model and the six propositions have not proven a causal relationship. Policy documents are also not enough to reconstruct the perceptions and mental frameworks of policymakers. Future research needs to use interviews, multi-resource surveys, network analysis, comparative studies, longitudinal design, process tracing, and mixed

methods to test cross-level mechanisms and differentiate the impact of sports tourism from tourism growth in general.

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GOVERNING AI-ASSISTED STRATEGY TOOLS: A SUBSTITUTABILITY– COMMITMENT FRAMEWORK AND THE ROLE OF EPISTEMIC CUSTODY

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ABSTRACT

Artificial intelligence now performs much of the analytical work that established strategy tools were designed to structure. Existing research asks which tools can be automated. This article asks a prior question: whether the authority and organisational value of a strategic instrument survive when its analytical core is machine-generated. Approach. The article is conceptual and follows a theory-construction design, synthesising the strategy-as-practice, AI-enabled decision-making and corporate governance literatures through a documented search and inclusion procedure. Framework. The Substitutability–Commitment Framework classifies strategic instruments along two independent dimensions: analytical substitutability, the extent to which a tool’s cognitive work is machine-executable, and commitment durability, the extent to which its output binds organisational resources. Crossing the dimensions yields four classes, each implying a distinct governance response. The framework is complemented by epistemic custody, defined as the explicit allocation of responsibility for producing, verifying, contesting and authorising strategic judgements. Contribution. The article separates substitutability from commitment, identifies three observable failure modes, maps thirteen widely used instruments to the framework, and advances seven refutable propositions. Epistemic custody is distinguished from accountability, human oversight and decision rights. Implications. Boards require custody arrangements rather than technical assurance alone. The withdrawal of South Africa’s Draft National Artificial Intelligence Policy in April 2026, following the discovery of fabricated references, is used solely to illustrate the framework’s plausibility. It is not evidence validating the framework, which remains untested.

Keywords: Artificial Intelligence; Strategy Tools; Strategic Decision-Making; Epistemic Custody; Corporate Governance

INTRODUCTION

Strategic management has long relied on analytical instruments to support environmental scanning, competitive analysis and organisational decision-making. Frameworks such as PESTEL, Porter's Five Forces, SWOT analysis, portfolio matrices, the Balanced Scorecard and the Business Model Canvas continue to shape strategic practice despite many having been developed several decades ago (Qehaja & Kutllovci, 2020; George, 2025; Seidl et al., 2024). Their longevity reflects more than familiarity. These instruments provide a structured way of organising information, facilitating strategic dialogue and supporting collective judgement. Research in the strategy-as-practice tradition argues that strategy is not simply something organisations possess but something managers actively construct through shared practices and analytical tools (Jarzabkowski et al., 2022; Kohtamäki et al., 2022; Seidl et al., 2024). Consequently, the value of a strategy instrument extends beyond its analytical output to the organisational process through which that output is produced.

The emergence of artificial intelligence (AI) has fundamentally altered the environment in which these instruments operate. Most established strategy frameworks were designed when analytical capacity was limited, information was costly to obtain and strategic analysis depended almost entirely on human expertise (George, 2025; Kemp, 2024; Krakowski et al., 2023). Their purpose was therefore to simplify complexity by reducing large volumes of information into manageable analytical structures. AI has largely removed that constraint. Large language models and other forms of generative AI can now synthesise evidence, generate strategic options and evaluate business scenarios in seconds. Recent studies demonstrate that AI can perform many cognitive tasks associated with strategic analysis at levels comparable with experienced managers under particular conditions (Csaszar et al., 2024). At the same time, evidence suggests that AI complements rather than replaces managerial expertise, increasing the importance of coordination, interpretation and governance (Aleksieva et al., 2026; Krakowski et al., 2023).

Although important, this question addresses only part of the challenge. The authority of a strategic instrument depends not only on the conclusions it generates but also on how those conclusions are produced and who is accountable for them. Much of the emerging literature therefore asks which established strategy tools can be performed by AI (Keding, 2021; Burke & Wolf, 2021; Shrestha et al., 2019; Simkute et al., 2024). A Five Forces analysis developed through executive deliberation represents both an assessment of industry structure and a record of collective organisational judgement. The same analysis generated by AI may reach similar conclusions while lacking the deliberative process that gives those conclusions organisational legitimacy. The critical question is therefore not whether AI can perform strategic analysis, but whether the strategic value of an instrument changes when its underlying cognitive work is transferred from people to machines. Some strategy instruments lose little through automation because their value lies primarily in information processing. Others retain their familiar appearance while losing much of the epistemic authority that originally justified their use (Burke & Wolf, 2021; Jarzabkowski et al., 2022; Kohtamäki et al., 2022).

This challenge also exposes an important tension within strategic management theory. The resource-based view argues that sustained competitive advantage depends on valuable, rare, imperfectly imitable and non-substitutable resources (Kemp, 2024; Krakowski et al., 2023). If organisations increasingly rely on the same foundation models, trained on similar datasets and prompted in comparable ways, strategic analysis itself may become increasingly homogeneous. Rather than creating differentiation, AI may encourage convergence in strategic thinking. This concern aligns with the concept of algorithmic monoculture, which demonstrates

that widespread reliance on common algorithmic systems can reduce diversity in decision-making even when those systems outperform individual alternatives (Kleinberg & Raghavan, 2021). Similarly, Brynjolfsson argues that the greatest value of AI lies not in replicating human judgement but in extending it through complementary capabilities (Brynjolfsson, 2022).

The governance response has developed rapidly but remains focused primarily on AI systems rather than strategic work itself. The European Union Artificial Intelligence Act introduced a risk-based regulatory framework in 2024 (European Union, 2024). The United States National Institute of Standards and Technology Artificial Intelligence Risk Management Framework provides guidance through the functions of govern, map, measure and manage (National Institute of Standards and Technology, 2023). ISO/IEC 42001 established the first certifiable management system standard for AI (International Organization for Standardization, 2023), while the revised OECD AI Principles provide a common governance vocabulary across jurisdictions (Organisation for Economic Co-operation and Development, 2024). These frameworks establish important governance principles but offer limited guidance on which strategic activities should be delegated to AI, which require continued human deliberation and where accountability should remain.

South Africa provides a timely illustration of this governance challenge. In April 2026, the Department of Communications and Digital Technologies withdrew the Draft National Artificial Intelligence Policy after fabricated academic references were identified in a document approved by Cabinet on 25 March 2026 and published on 10 April 2026; the withdrawal was announced on 26 April and gazetted on 12 June 2026 (Republic of South Africa, 2026; South African Government News Agency, 2026). Rather, it reflected a failure to establish clear responsibility for verifying AI-generated content before it entered a formal policy process. The episode demonstrates that the principal governance challenge may not be the capability of AI itself, but uncertainty regarding who remains accountable for knowledge generated through AI-assisted analysis. Fabricated citation is a measured property of these systems rather than an isolated malfunction: cross-disciplinary testing finds substantial proportions of model-generated references unverifiable (Mugaanyi et al., 2024), and fabrication rates vary with topic familiarity and prompt specificity (Linardon et al., 2025). The incident did not arise because AI was incapable of generating text.

This article addresses that gap by developing the Substitutability-Commitment Framework, which classifies strategic instruments according to two independent dimensions: the extent to which their underlying cognitive work can be substituted by AI and the degree to which their outputs commit organisational resources. The framework is complemented by the concept of epistemic custody, defined as the explicit allocation. Together, these concepts provide a practical basis for determining where AI can appropriately augment strategic management and where human accountability remains indispensable. responsibility for producing, verifying, contesting and authorising AI-assisted strategic judgements

Three research questions follow. RQ1 asks under what conditions the organisational authority of a strategy tool survives the automation of its analytical core. RQ2 asks how responsibility for producing, verifying, contesting and authorising machine-assisted strategic analysis should be allocated. RQ3 asks which observable failure modes arise when that responsibility is left unallocated.

The article makes four contributions. First, it develops a conceptual framework for classifying strategic instruments according to their substitutability and governance requirements. Second, it identifies three observable failure modes associated with AI-assisted strategy development and explains how they may be recognised in practice. Third, it proposes a board-level diagnostic together with a crosswalk that maps widely used strategy instruments

within the framework. Finally, drawing on South African governance arrangements and emerging international standards, it argues that many of the responsibilities needed to govern AI-assisted strategy already exist within established legal and corporate governance frameworks (Institute of Directors in South Africa, 2016; Republic of South Africa, 2008; Republic of South Africa, 2013). What has been missing is a practical framework that identifies where those responsibilities arise and how they should be exercised as AI becomes embedded in strategic management.

Terminology is used as follows throughout. AI-assisted describes a process in which a machine contributes to analytical work for which a person remains answerable. Machine-generated describes an artefact produced by a machine. Automated describes a task performed without human contribution at the point of execution. Substitution denotes the replacement of human cognitive work by machine execution. Augmentation denotes the combination of human and machine contribution to one task; substitution and augmentation are treated as distinct outcomes rather than poles of a continuum (Raisch & Krakowski, 2021). Epistemic custody, algorithmic monoculture and the substitutability–commitment distinctions are constructs developed in this article and are defined at first use.

LITERATURE REVIEW

What the Evidence on Machine-Generated Strategy Actually Shows

The empirical literature has moved quickly and now supports several firm conclusions. Csaszar et al. (2024), drawing on an accelerator programme and a start-up competition, find that large language models produce and assess strategies at a standard, and they map the consequences for search, representation and aggregation. Comparable to experienced practitioners, a finding extended by evidence that generative tools also shift how strategic decisions are evaluated (Doshi et al., 2025) and raise measured productivity in professional work (Brynjolfsson et al., 2025). Krakowski et al. (2023) establish that substitution and complementation occur together rather than in sequence, so AI destroys some sources of advantage while creating others simultaneously. Shrestha et al. (2019) offer the most directly prescriptive contribution, specifying when decision authority should be fully delegated to algorithms, hybridised in sequence, or aggregated across human and machine judgement.

Two qualifications recur, and both point the same way. On the direction of the effect, Alekseeva et al. (2026) find AI adoption associated with rising demand for managerial skill, with the emphasis moving from budgeting and planning towards coordination and stakeholder work; Raisch and Krakowski (2021) theorise this as an automation–augmentation paradox that organisations must manage rather than resolve. On the object of substitution, Brynjolfsson (2022) warns that pursuing machines which imitate people crowds out machines which extend them, with consequences for bargaining power. Applied to strategy tools, both suggest interesting design question is not how much of the task a machine can assume, but which division of labour leaves the resulting decision better warranted (Csaszar et al., 2024; Raisch & Krakowski, 2021; Shrestha et al., 2019).

Three Gaps

A third literature, largely disconnected from the first two, concerns what happens when machine output enters consequential processes unverified. Kleinberg and Raghavan (2021) show formally that reliance on a single algorithmic assessor can worsen aggregate outcomes even where that assessor is individually superior, because correlated errors no longer cancel. Vanneste and Puranam (2025) examine how trust in artificial agents forms and how perceptions

of agency shape willingness to rely on their output, which bears directly on whether verification happens at all. Simkute et al. (2024) documents how productivity gains from generative systems are offset where review capacity does not scale with output volume. This work has not been connected to the strategy tools tradition and making that connection is the task here.

Three unresolved problems follow. First, the field lacks a principled basis for deciding which instruments to delegate: existing prescriptive work specifies conditions for delegating decision authority (Shrestha et al., 2019) but does not distinguish tools whose value survives automation from tools whose value it destroys (Burke & Wolf, 2021; Seidl et al., 2024). Second, the commoditisation of analysis has not been reconciled with a theory of advantage predicated on heterogeneity, leaving the resource-based view and the evidence on machine-generated strategy in unresolved tension (Csaszar et al., 2024; Kemp, 2024; Kleinberg & Raghavan, 2021). Third, verification is treated as a technical property of systems rather than an allocation of accountability inside an organisation, which is why episodes such as the South African withdrawal get read as quality-control failures rather than governance-design failures (Institute of Directors in South Africa, 2016; Republic of South Africa, 2013; Republic of South Africa, 2026). Section 4 addresses all three.

Epistemic custody must be distinguished from adjacent constructs. Accountability concerns who answer for an outcome after the fact; custody concerns who is answerable for the epistemic status of an input before it is acted upon. Human oversight requires a person in the loop without specifying what that person must be able to establish. Responsibility allocation and decision rights assign authority over a choice, whereas custody assigns authority over the warrant for the evidence on which the choice rests. Assurance and auditability are retrospective and evidentiary, and the audit literature accordingly places its instruments after deployment (Kazim et al., 2021), contestability concerns standing to challenge a decision already taken. Custody is prospective and artefact specific.

Four adjacent literatures bear on the problem. Research on algorithm aversion establishes that reluctance to rely on machine output is systematic and varies with algorithm, individual, task and setting (Mahmud et al., 2022), which matters because a governance arrangement assuming uniform willingness to challenge machine output will misallocate the contesting role. Work on explainable AI shows that explanation for end users pursues understandability, trustworthiness, transparency, controllability and fairness, and that no single form satisfies all of them (Laato et al., 2022), a custodian who cannot interrogate an output cannot answer for it. Research on organisational AI governance defines the field as the translation of ethical principles into firm-level process (Mäntymäki et al., 2022) and documents the practices and barriers involved (Papagiannidis et al., 2023), while a recent synthesis maps its unresolved gaps (Birkstedt et al., 2023). Evidence on human–AI teaming qualifies the optimistic reading: combinations improve performance on content creation but lose performance on decision tasks (Vaccaro et al., 2024). Across all four, the object of governance is the AI system and its lifecycle. None addresses the analytical artefact once it enters a strategic process, which is the gap this construct occupies. the value of assistance varies with the experience of the recipient (Wang et al., 2023), and AI is better studied as part of a system of work than as a discrete instrument (Anthony et al., 2023).

RESEARCH METHOD

This is a conceptual article, and its method is theory construction rather than hypothesis testing. It begins from an inconsistency between two established bodies of work: the strategy tools tradition, which holds that a tool's authority depends on its process of production (Burke

& Wolf, 2021; George, 2025; Kohtamäki et al., 2022), and the evidence that machines now produce those outputs to professional standard (Alekseeva et al., 2026; Csaszar et al., 2024; Krakowski et al., 2023). Where two literatures generate incompatible implications, conceptual work is the appropriate response, and the resulting framework is assessed against the usual criteria: whether it explains what existing apparatus cannot, whether its constructs are distinguishable and observable, and whether it yields propositions capable of refutation (Doshi et al., 2025; Raisch & Krakowski, 2021; Shrestha et al., 2019).

The framework is illustrated rather than tested. Illustration draws on documented cases, chiefly the withdrawal of South Africa's draft AI policy in April 2026, reported consistently across the Government Gazette record and multiple independent outlets (Department of Communications and Digital Technologies, 2024; Republic of South Africa, 2026; South African Government News Agency, 2026), and on regularities established in the studies reviewed above (Csaszar et al., 2024; Kleinberg & Raghavan, 2021; Krakowski et al., 2023). No claim of statistical generalisation is made. The South African material serves two purposes: it grounds an abstract argument in a setting where consequences were observable and severe, and it allows the governance implications to be connected to specific statutory duties rather than to regulation in prospect (Institute of Directors in South Africa, 2016; Republic of South Africa, 2008; Republic of South Africa, 2013). Section 7 states the limits of this approach and specifies the empirical work needed to test the propositions.

This article is conceptual and adopts a theory-construction design in which the framework is derived from an identified inconsistency between literature rather than induced from data. The derivation is set out so that the dimensions can be assessed as theoretically generated rather than author imposed.

Literature was identified through Scopus, Web of Science and Google Scholar, searched between January and March 2026. Search strings combined strategy tool terms with artificial intelligence terms, and separately with governance and accountability terms. Coverage was restricted to peer-reviewed articles in English, supplemented by regulatory instruments where these were the primary source for a normative claim. Sources were included where they addressed the production or use of strategic analysis, the substitution of analytical labour, or responsibility for machine-generated content, and excluded where AI appeared only as a technical topic without bearing on strategic decision-making. Backward and forward citation searching was applied until no further relevant work emerged.

The two dimensions were derived by asking, of each retained source, what property of a strategy tool its argument turned on. Two recurred and were consistently conflated. Analytical substitutability came from the automation literature; commitment durability from the strategy-as-practice and governance literatures. Three alternatives were rejected: task complexity, which correlates with substitutability without adding governance implications; data availability, an antecedent rather than a property of the tool; and organisational level, since instruments at the same level differ on both retained dimensions.

Both dimensions carry observable indicators so that a classification can be checked rather than asserted. Substitutability is judged high where the task is bound, the information it requires is documented, and performance is checkable against an external referent. Commitment is judged binding where the output triggers resource allocation and that allocation either cannot be reversed within one planning cycle or carries reputational or contractual cost on reversal.

The thirteen instruments were selected because they appear in standard strategic management texts and in the studies reviewed, and because together they span both dimensions. Where an instrument satisfied the criteria for more than one quadrant it was recorded as splitting

rather than forced into a single cell, and the split is reported in Table 3. Classification was performed by the author alone; the absence of independent coding is stated as a limitation. The South African case was selected on three criteria: the failure is documented in the public record and therefore verifiable; it occurred where analysis converted into binding commitment; and it arose in a jurisdiction with codified directors' duties. It is used to illustrate plausibility. A single case cannot validate a framework or establish three failure modes, and no such claim is made.

RESULTH AND DISCUSSION

The Substitutability–Commitment Framework Two Dimensions the Literature Has Run Together

The framework rests on two dimensions that existing work has treated as one. The first, analytical substitutability, is how far from the cognitive work a tool performs can be executed by machine at or above the standard a competent analyst would reach. It is high where the task is bounded, the relevant information documented and performance checkable against an external referent, which describes most environmental scanning and much comparative analysis (Csaszar et al., 2024; George, 2025; Shrestha et al., 2019). It is low where the task requires constructing a novel representation of an ambiguous situation, since representation, unlike search, resists delegation (Csaszar et al., 2024; Doshi et al., 2025; Kim et al., 2024). Substitutability belongs to the task rather than the tool's name, and it moves as capability moves, which is why the framework is applied recursively (Brynjolfsson, 2022; Krakowski et al., 2023). The second dimension, commitment durability, is how far the output binds resources in ways costly or impossible to reverse. It is low where a decision can be revisited cheaply, such as a periodic scan of the competitive environment, and high where it commits capital, capability or reputation over a horizon in which reversal is expensive (George, 2025; Kemp, 2024; Krakowski et al., 2023). This captures what the dynamic capabilities literature identifies as path dependence: the weight of a strategic choice lies less in its analytical content than in the options it closes off (George, 2025; Krakowski et al., 2023). The dimensions are independent, and that independence is the framework's structural claim. A task may be highly machine-executable and still bind the firm irreversibly, and it is exactly this combination where governance is hardest (Kleinberg & Raghavan, 2021; Shrestha et al., 2019; Vanneste & Puranam, 2025).

Four Classes of Instrument

Crossing the dimensions produces four classes, shown in Figure 1 and specified in Table 1. The classification is not ranking. Each class describes a different relationship between machine capability and human accountability, and each requires a different design response (Burke & Wolf, 2021; Raisch & Krakowski, 2021; Shrestha et al., 2019).

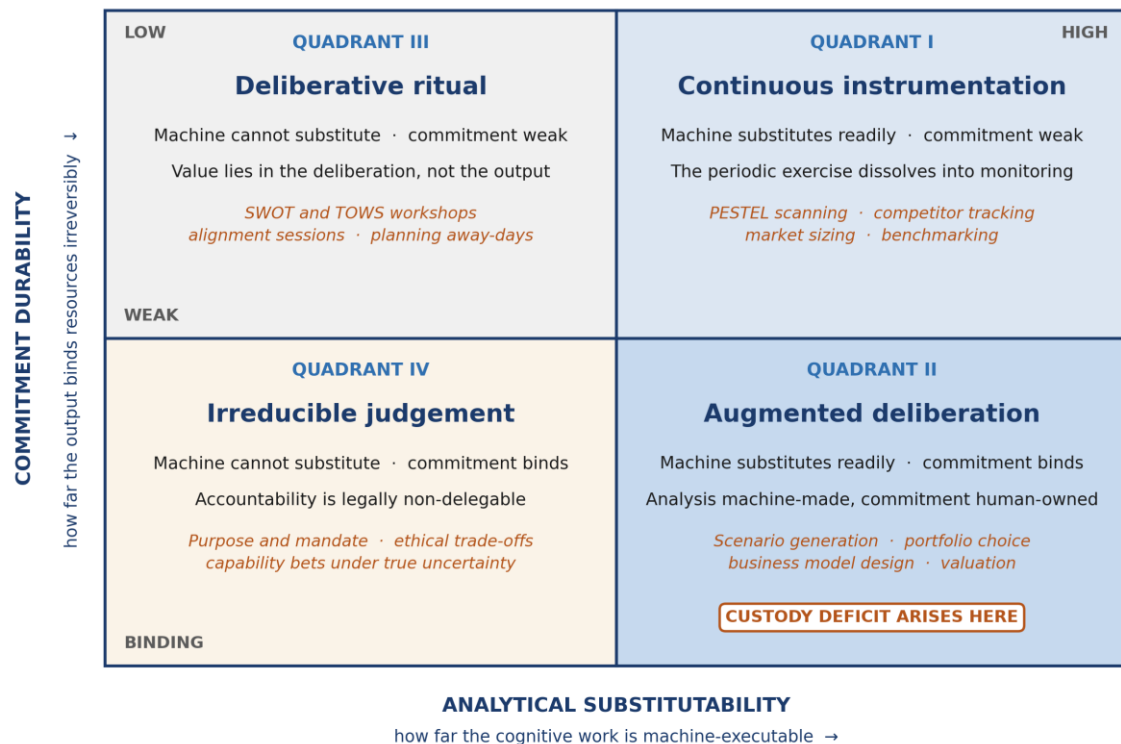


Figure 1. The Substitutability–Commitment Framework

Instruments are located by how far their cognitive work is machine-executable and how irreversibly their output binds resources. Epistemic custody applies in all four quadrants; the custody deficit is most damaging in Quadrant II, where machine-generated analysis supports binding commitment. Source: Author’s construction.

Quadrant II, augmented deliberation, is the contested zone and the framework’s main concern. Scenario generation, portfolio choice, business model design and valuation are substantially machine-executable yet issue in binding commitment (Qehaja & Kutlllovci, 2020; Csaszar et al., 2024; George, 2025). The appropriate division of labour has the machine generating and evaluating options at a scale no team could match, while humans retain the commitment decision and the obligation to explain it (Raisch & Krakowski, 2021; Shrestha et al., 2019). This is where the evidence of Csaszar et al. (2024) bites hardest, and where custody becomes indispensable, because machine-generated analysis arrives without the deliberative record that ordinarily makes a commitment defensible (Burke & Wolf, 2021; Vanneste & Puranam, 2025).

Table 1. The four classes of strategic instrument and the design response each implies

Quadrant	Substitutability	Commitment	Representative instruments	Design response
I. Continuous instrumentation	High	Weak	PESTEL scanning, competitor tracking, market sizing, benchmarking	Dissolve the periodic exercise into standing monitoring; specify attention triggers
II. Augmented deliberation	High	Binding	Scenario generation, portfolio choice, business model design, valuation	Machine generates options at scale; humans own commitment and

Quadrant	Substitutability	Commitment	Representative instruments	Design response
				must be able to explain it
III. Deliberative ritual	Low	Weak	SWOT and TOWS workshops, alignment sessions, planning away-days	Protect the deliberative process; treat machine output as input, never as product
IV. Irreducible judgement	Low	Binding	Purpose and mandate, ethical trade-offs, capability bets under uncertainty	Reserve explicitly from delegation; record the reservation and its basis

Substitutability is a property of the task rather than the tool's label, so classifications should be revisited as machine capability advances.

Source: Author's construction.

Epistemic Custody

The two dimensions establish where machine capability may be deployed but say nothing about when its output may be relied upon. Epistemic custody fills that gap. It is defined here as the identifiable allocation of three obligations: to verify the inputs and factual claims on which an output rests, to contest that output before it becomes binding, and to answer for the decision that follows. Custody is an organisational allocation rather than a technical property, and it can be absent even where the system performs well (Burke & Wolf, 2021; Shrestha et al., 2019; Vanneste & Puranam, 2025). It runs across all four quadrants, though what it requires differs: data provenance in Quadrant I, a named reviewer and a contestation point in Quadrant II, protection of the deliberative process in Quadrant III, and discharge by the accountable person in Quadrant IV (Institute of Directors in South Africa, 2016; Raisch & Krakowski, 2021; Republic of South Africa, 2008).

Three Failure Modes

Custody deficit occurs when machine-generated material enters a process faster than it can be verified, so verification degrades into formality while accountability remains nominally assigned. Its signature is the appearance, in consequential documents, of claims nobody identifiable checked. South Africa's draft AI policy is a documented instance: the tool worked, the process assigned responsibility on paper, and in a Cabinet-approved document a reported ten per cent or more of the academic references were nonetheless fabricated (Department of Communications and Digital Technologies, 2024; Republic of South Africa, 2026; South African Government News Agency, 2026). The Minister's own diagnosis, that citations were included without proper verification, describes custody deficit rather than model failure (Republic of South Africa, 2026; Rest of World, 2026; Vanneste & Puranam, 2025).

Applying The Framework

Figure 2 sets out the procedure, which is recursive rather than linear because substitutability moves. An instrument correctly placed in Quadrant III today may become partly machine-executable within a product cycle, and a classification treated as permanent will be wrong before anyone reviews it (Brynjolfsson, 2022; Csaszar et al., 2024; Krakowski et al., 2023). The first three steps establish the division of labour and the custody allocation; the last two institutionalise monitoring and reclassification, without which the framework becomes

another static artefact of the kind it exists to prevent (Burke & Wolf, 2021; George, 2025; National Institute of Standards and Technology, 2023).

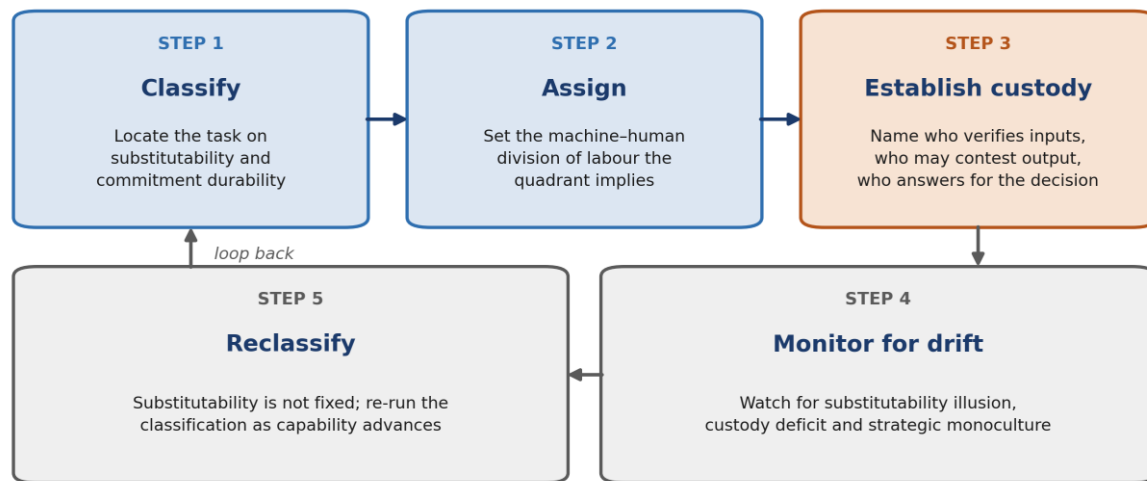


Figure 2. Applying The Framework: A Five-Step Recursive Procedure

Steps 1 to 3 establish classification, division of labour and custody; steps 4 and 5 institutionalise monitoring for the three failure modes and periodic reclassification as machine capability advances. Source: author's construction.

Table 2. Diagnostic Instrument Derived from The Framework, Designed to Be Answerable by A Board Committee or Strategy Function Without Specialist Technical Knowledge

Diagnostic question	Failure mode indicated	Remedial action
Can we name the person who verified the factual claims in this output?	Custody deficit	Assign verification before the output enters any binding process
Did anyone contest this output before it became binding?	Custody deficit	Establish a contestation point with standing to reject
Would this artefact bind anyone who did not help produce it?	Substitutability illusion	Restore the deliberative process; reclassify to Quadrant III
Could a competitor using the same tools reach this conclusion?	Strategic monoculture	Add proprietary data or judgement; treat output as baseline, not answer
Has verification capacity grown with output volume?	Custody deficit	Constrain generation to the rate at which review can absorb it
Is any Quadrant IV determination resting on unattributable analysis?	Custody deficit at board level	Reserve explicitly; record the basis of the reservation
When was this classification last revisited?	Stale classification	Re-run steps 1 to 3 on a defined cycle

Source: Author's Construction

Propositions

Stating refutable propositions is what separates a framework from a taxonomy (Doshi et al., 2025; Raisch & Krakowski, 2021; Shrestha et al., 2019). On classification, P1 holds that firms automating Quadrant III instruments will show lower subsequent implementation of the resulting strategy than firms retaining the deliberative process, controlling for analytical quality (Burke & Wolf, 2021; Jarzabkowski et al., 2022; Kohtamäki et al., 2022), P2 holds that automating Quadrant I instruments yields efficiency gains with no measurable effect on strategic commitment (Csaszar et al., 2024; George, 2025; Shrestha et al., 2019). On custody, P3 holds that the incidence of unverified claims rises with the ratio of machine-generated

content to available review capacity rather than with volume as such (Republic of South Africa, 2026; Simkute et al., 2024; Vanneste & Puranam, 2025), P4 holds that organisations with a named contestation point will show fewer such incidents than those relying on diffuse review, whatever the sophistication of their tools (National Institute of Standards and Technology, 2023; Republic of South Africa, 2008; Shrestha et al., 2019).

On advantage, P5 holds that, observable in the similarity of disclosed strategic priorities strategic positions within an industry will converge as the proportion of firms using common foundation models rises, advantage depending on how AI is situated within a firm rather than on access to it (Kemp, 2024; Kleinberg & Raghavan, 2021; Krakowski et al., 2023). P6 holds that firms combining machine analysis with proprietary data unavailable to rivals will retain performance heterogeneity while those relying on machine analysis of public information will not, which follows directly from the requirement that advantage-generating resources be rare and imperfectly imitable (Brynjolfsson, 2022; Kemp, 2024; Krakowski et al., 2023). On context, P7 holds that returns to Quadrant II augmentation are conditional on data infrastructure and verification capacity, so that where both are constrained the observed returns will be lower and custody deficit more frequent (Alekseeva et al., 2026; Department of Communications and Digital Technologies, 2024). That proposition is directly testable in South Africa, and Section 6 takes it up.

A CROSSWALK ACROSS THE CANONICAL TOOLKIT

The Scanning Family

The Resource and Portfolio Family

The Deliberative Family

The Measurement and Commitment Family

The crosswalk is presented in Table 3. Each instrument is located by the analytical task it performs rather than by its label, with the quadrant, the expected line of development and the element that must remain human stated for each. The narrative walkthrough of each instrument family has been removed to meet the page limit, since Table 3 carries the same content.

Table 3. Crosswalk Between the Canonical Toolkit and The Substitutability–Commitment Framework

Instrument	Analytical core	Quadrant	How it evolves	What must remain human
PESTEL / environmental scanning (George, 2025)	Structured gathering of macro-environmental signals	I	Dissolves into continuous automated sensing; the periodic report disappears	Deciding what is material and what triggers attention
Five forces (George, 2025)	Assessment of industry structure and bargaining relations	I → II	Populated and updated by machine in near real time	Defining the industry boundary, which governs everything the analysis shows
Value chain (George, 2025)	Mapping of activities and their cost and value contribution	I	Automated from operational and financial data	Judging which activities are

Instrument	Analytical core	Quadrant	How it evolves	What must remain human
				strategically distinctive
Resource audit / VRIO (Kemp, 2024)	Inventory and assessment of resource positions	II	Inventory automated; assessment machine-assisted	Judging imitability against what rivals could actually replicate
Ansoff matrix	Generation of product and market growth options	II	Option sets generated at scale and evaluated against evidence	Committing capital and carrying the consequences
Growth-share matrix (George, 2025)	Allocation of resources across a business portfolio	II	Continuous rather than annual repositioning	Resource commitment; resisting convergence on the industry baseline
SWOT / TOWS (Qehaja & Kutllovci, 2020)	Systematic matching of internal and external factors	III	Automating the output is proposed to erode the tool's function, which lies in the deliberation	The deliberation itself, which is what creates commitment
McKinsey 7S (Qehaja & Kutllovci, 2020)	Diagnosis of organisational alignment, hard and soft	III → IV	Hard elements measurable; soft elements resist external assessment	Participation of those assessed; authority to prompt change
Scenario planning (Qehaja & Kutllovci, 2020; George, 2025)	Construction of futures to test governing assumptions	II and III	Generation migrates to machine; engagement stays human	Confronting the board with the possibility that its assumptions are wrong
Balanced scorecard (George, 2025)	Translation of strategy into a limited set of measures	I and IV	Tracking fully automated; selection is not	Choosing what counts as important, which commits behaviour
Business model canvas (Qehaja & Kutllovci, 2020)	Explicit statement of a firm's value logic	II	Configurations generated and stress-tested by machine	Commitment to a configuration and its foreclosed alternatives
Strategy canvas (Qehaja & Kutllovci, 2020)	Comparison of value curves against industry convention	II	Machine-assisted, but highly exposed to convergence	Departing from the baseline the models themselves produce
Purpose, mandate, ethical trade-offs	Determination of what the organisation is for	IV	Machine may inform; it cannot hold the determination	The accountable person; in South African law, non-delegable

Quadrant assignments describe the dominant analytical task and should be revisited as capability advances. Several instruments split across quadrants, which is itself the diagnostically useful result.

Source: Author's construction.

What the Crosswalk Reveals

THE SOUTH AFRICAN SETTING

Governance Without Waiting for Legislation

Why the framework binds differently in a middle-income economy

South African conditions make that condition binding rather than theoretical, particularly in smaller firms where analysis and decision are rarely separated (Wyk, 2023).

Discussion

What this Changes Theoretically

The framework's principal claim is that substitutability and commitment are independent, and that treating them as a single dimension running from manual to automated has hidden the cases that matter. The literature has organised itself around the substitutability axis, asking what machines can do (Csaszar et al., 2024; Krakowski et al., 2023; Shrestha et al., 2019). Adding commitment shows that the hard cases are not those of highest capability but those where high capability meets binding consequence, and that a second class of difficulty arises where low substitutability meets weak commitment, since those instruments are the most likely to be automated precisely because it appears costless (Burke & Wolf, 2021; George, 2025; Seidl et al., 2024). This connects the strategy-as-practice tradition to the AI and strategy literature, which have developed largely in parallel (Csaszar et al., 2024; Jarzabkowski et al., 2022; Kohtamäki et al., 2022).

The monoculture argument carries a sharper implication for the resource-based view than has been acknowledged. If advantage requires resources that are rare and imperfectly imitable (Kemp, 2024), and strategic analysis becomes available to all rivals at near-zero marginal cost and comparable quality (Csaszar et al., 2024), then analysis is disqualified as a source of advantage and the locus shifts to proprietary data, to the quality of the questions posed, and to judgement at the point of commitment (Brynjolfsson, 2022; Kleinberg & Raghavan, 2021; Krakowski et al., 2023). That is consistent with Krakowski et al. (2023), who find new heterogeneity emerging from human-machine interaction rather than from the machine, and with Brynjolfsson (2022) on the returns to augmentation over imitation. Firms competing on the sophistication of their analytical apparatus are competing on a dimension that is actively commoditising (Kemp, 2024; Kleinberg & Raghavan, 2021; Krakowski et al., 2023).

What this Changes in Practice and Policy

For practice, the framework replaces the prevailing question, how much of our strategy work can AI do, with a sequence a board can adjudicate: which quadrant is this task in, what division of labour follows, and who holds custody (Institute of Directors in South Africa, 2016; Republic of South Africa, 2008; Shrestha et al., 2019). The diagnostic in Table 2 is built for that setting and the crosswalk in Table 3 lets a strategy function locate its existing instruments without first running a classification exercise of its own (Csaszar et al., 2024; George, 2025; Seidl et al., 2024). The most consequential implication is counter-intuitive: the framework recommends constraining generation to the rate verification can absorb, so the correct response to a custody deficit is often to produce less rather than review faster (Republic of South Africa, 2026; Simkute et al., 2024; Vanneste & Puranam, 2025).

For policy, three implications follow. Regulatory attention should attach to the custody allocation rather than the technology, since the South African episode shows failure arising from process design rather than model defect (Republic of South Africa, 2013; Republic of South Africa, 2026; South African Government News Agency, 2026). Guidance to public entities should specify verification obligations for machine-assisted documents, which existing governance codes imply but do not make explicit (European Union, 2024; Institute of Directors

in South Africa, 2016; International Organization for Standardization, 2023). And the National AI Policy process, when resumed, would be strengthened by addressing the state's own use of AI as directly as it addresses regulation of AI in the market, since the state is a substantial deployer and the withdrawal illustrates the consequences (Department of Communications and Digital Technologies, 2024; Republic of South Africa, 2026).

The episode is not jurisdictionally peculiar. Within ASEAN, of which Indonesia is a member state, the ASEAN Guide on AI Governance and Ethics (ASEAN, 2024) and its generative-AI expansion (ASEAN, 2025) set out principles of accountability, transparency and human-centricity across the AI lifecycle. Like the South African material, both govern the system rather than the analytical artefact it produces. That shared omission is what the custody construct addresses, and it suggests the framework applies in any developing economy where binding decisions rest on machine-generated analysis.

For boards and executive teams, the framework converts an open question about capability into a sequence that can be minuted. The diagnostic in Table 2 is designed to be worked through by a board committee in a single sitting without specialist technical input. For each instrument in use, the committee establishes the quadrant, records the division of labour between machine and human, and names the individual holding custody. The custody holder is a named person rather than a function, because a function cannot be asked on what basis a claim is believed on. This sits within a wider re-examination of the board monitoring role under AI, which asks what directors must be able to establish rather than merely receive (Hilb, 2020; Kourabas & Tsang, 2025). Where no name can be supplied, the instrument should not proceed to a committing decision until one can.

Three implementation steps follow. First, the strategy function locates existing instruments using the crosswalk in Table 3, avoiding a classification exercise from first principles. Second, verification obligations attach to Quadrant II instruments specifically, since these combine high substitutability with binding commitment. Third, the classification is reviewed at a fixed interval, because substitutability moves. In South African practice these steps extend existing duties under the Companies Act and King IV rather than creating new ones.

Limits and What Should be Tested

Three limitations should be stated plainly. The framework is conceptual and unvalidated; its propositions are refutable but unrefuted, and the illustrative material establishes plausibility rather than support (Csaszar et al., 2024; Doshi et al., 2025; Shrestha et al., 2019). Its dimensions are presented as continual but operationalised only qualitatively, and measurement instruments, particularly for commitment durability, are needed before the propositions can be tested (Kemp, 2024; Krakowski et al., 2023; Raisch & Krakowski, 2021). And it treats substitutability as exogenous, whereas firms shape it through their own investment and data practices, so a fuller treatment would model the co-evolution of capability and classification (Brynjolfsson, 2022; Krakowski et al., 2023; National Institute of Standards and Technology, 2023). The crosswalk carries a further caveat: its assignments reflect current capability and the dominant task within each instrument, and both will shift (Csaszar et al., 2024; George, 2025; Shrestha et al., 2019).

Four lines of empirical work follow. Field study of strategy processes before and after generative tools were introduced would test P1 and P2 directly, and the strategy-as-practice tradition supplies the method (Jarzabkowski et al., 2022; Kohtamäki et al., 2022; Seidl et al., 2024). Content analysis of disclosed strategic priorities across firms in one industry would test P5 using similarity measures over time (Kemp, 2024; Kleinberg & Raghavan, 2021; Krakowski

et al., 2023). Survey or archival work relating verification capacity to unverified claims would test P3 and P4, with the South African public sector an accessible setting given the documented case (Republic of South Africa, 2013; Republic of South Africa, 2026; South African Government News Agency, 2026). Comparative work across jurisdictions with differing infrastructure and skills endowments would test P7 and establish whether custody deficit is general or concentrated where verification capacity is scarce (Alekseeva et al., 2026; Department of Communications and Digital Technologies, 2024).

Summary of the propositions and how they may be tested. P1 and P2 concern the survival of tool authority under automation and follow from the substitutability dimension; both are testable through comparative field study of strategy processes before and after generative tools were introduced. P3 and P4 concern custody and its failure, testable through survey or archival work relating verification capacity to the incidence of unverified claims in committing documents. P5 concerns analytical convergence, testable through content analysis of disclosed strategic priorities within an industry using similarity measures over time. P6 and P7 concern the governance response, requiring longitudinal work relating custody arrangements to decision quality and to recurrence of the three failure modes. None has been tested here; the framework should be treated as a source of hypotheses rather than a validated instrument.

CONCLUSION

The strategy toolkit was built for a world in which analysis was scarce. That scarcity is over, and the field has responded by asking what machines can now do. This article argued that the question, however natural, leads away from the problem. A strategy tool's output has authority because of how it was produced, so automating production changes the standing of the output even when the content is unchanged. Some instruments come through intact. Others are hollowed out while continuing to look exactly as they always did, which is what makes the failure hard to see.

The Substitutability–Commitment Framework offers a way of telling these apart. It sorts instruments by how machine-executable their cognitive work is and how irreversibly their output binds, giving four classes each with its own design response, and it adds epistemic custody as the condition that must hold across all four. Applied across the canonical toolkit, it shows that several familiar instruments split across quadrants, that the tools most readily automated are those that contributed least to advantage, and that the ones surviving automation intact are those whose value was never informational. Its central practical claim is that the constraint worth managing is verification rather than generation, and that in many organisations the right response to abundant machine analysis is to slow its entry into binding processes rather than accelerate its review.

Three claims should be kept apart. What the literature establishes is that machines now produce strategic analysis to professional standard, that reliance on a common assessor can worsen aggregate outcomes, and that a tool's authority derives from its process of production. What this article proposes, and has not demonstrated, is that substitutability and commitment are independent, that four classes follow, that epistemic custody is the condition holding across them, and that three failure modes arise when custody is unallocated. What must be tested is every one of the seven propositions. The South African withdrawal is consistent with the framework and was the occasion for developing it, but a single documented failure cannot establish a construct.

CONFLICTS OF INTEREST

The author declares no competing interests. The views expressed are his own and do not represent the position of the affiliated entity. No funding was received for this work.

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COMMUNITY-BASED MANGROVE PLANTING TO SUPPORT COASTAL CONSERVATION IN TANJUNG PASIR VILLAGE, TANGERANG REGENCY

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ABSTRACT

The coastal area of Tanjung Pasir Village, Teluknaga Subdistrict, Tangerang Regency, faces various environmental challenges, including coastal erosion, land-use change, and pressures on the sustainability of mangrove ecosystems. These conditions highlight the need for conservation activities involving the participation of multiple stakeholders. This community service activity aimed to implement a community-based mangrove planting activity to support coastal conservation in Tanjung Pasir Village. The community service activity was conducted on May 31, 2026, involving 30 participants, including Master of Management students from Matana University, their family members, local community members, village government representatives, and members of the Tourism Awareness Group (Pokdarwis). The activity adopted the Participatory Learning and Action (PLA) approach through four stages: Learn, Act, Reflect, and Evaluate. All 300 mangrove seedlings of *Avicennia* sp. and *Rhizophora* sp. were planted during the activity. The activity also provided a shared learning process on climate change and the importance of mangrove ecosystem conservation. Evaluation was conducted through an open discussion on activity implementation, challenges, and follow-up needs. No post-planting survival monitoring was conducted; therefore, seedling survival, growth, and longer-term ecological outcomes could not be assessed. The activity shows the feasibility of involving students and community stakeholders in community-based mangrove planting while highlighting the need for follow-up monitoring.

Keywords: Mangrove Conservation; Coastal Conservation; Community Participation; Participatory Learning and Action; Tanjung Pasir

INTRODUCTION

Coastal Conditions of Tanjung Pasir Village

Tanjung Pasir Village is one of the coastal areas located in Teluknaga Subdistrict, Tangerang Regency, Banten Province. This area holds significant coastal resource potential, including a mangrove ecosystem that plays an important role in maintaining coastal environmental balance. Nevertheless, the coastal area of Tanjung Pasir also faces various challenges such as erosion, land-use change, human activity, and pressures on the sustainability of mangrove vegetation.

Hidayat et al. (2021) identified spatial-use deviations in the coastal area of Tanjung Pasir that may affect coastal environmental conditions. More recent mapping by Rosmaida (2025) shows that the total mangrove vegetation area in Tanjung Pasir increased by 12.67 hectares (18.79%) between 2020 and 2024. The area classified as dense mangrove also increased from 46.03 hectares to 65.26 hectares. Despite this increase, mangrove vegetation in the study area still requires continued management and rehabilitation attention, as the 2024 mangrove area represented about 14.71% of the total study area and was classified as poor according to the referenced criteria.

At the broader coastal level, mangrove conditions in Teluknaga are also dynamic. Yumnaristya et al. (2023) examined the spatial and temporal distribution of mangrove biomass and carbon stocks in the Teluknaga coastal area over 2016-2022, highlighting the importance of continued conservation and monitoring in a coastal region experiencing land-use pressure. At the national level, Indonesia has extensive mangrove ecosystems, while mangrove management and rehabilitation remain important for maintaining coastal ecosystem sustainability (Rahmanto, 2020; Sasmito et al., 2023).

Tanjung Pasir Village therefore provides a relevant context for community-based mangrove conservation because it combines a documented history of spatial-use pressure, measurable changes in mangrove vegetation, an existing coastal mangrove ecosystem, and the availability of local stakeholders who can support conservation activities.

Previous community-based mangrove activities have also been conducted in Tanjung Pasir. Lantang et al. (2024) reported a multi-stakeholder program combining environmental education and mangrove planting in Tanjung Pasir through collaboration among state and non-state actors. Building on this local experience, the present activity was designed with a different emphasis: integrating environmental learning, field action, reflection, and evaluation within a single Participatory Learning and Action (PLA) sequence. Thus, the practical contribution of the present activity lies not in introducing mangrove planting as a new intervention in Tanjung Pasir, but in documenting the activity as a structured participatory learning-and-action process.

The Urgency of Mangrove and Coastal Conservation

Mangrove ecosystems provide important ecological functions, including coastal protection, habitat provision, and carbon storage, making their conservation relevant to the sustainability of coastal areas (Lovelock et al., 2024). In Indonesia, mangrove degradation and restoration remain important environmental challenges, while restoration efforts are increasingly connected with broader sustainable development objectives (Sasmito et al., 2023; Utami et al., 2024). These challenges highlight the importance of involving multiple stakeholders in mangrove conservation, including local communities, government actors, and higher education institutions. University-community partnerships can connect learning, community engagement, and local sustainability initiatives (Filho et al., 2023). The relevance

of such collaboration is also illustrated by the previous mangrove education and planting activity in Tanjung Pasir (Lantang et al., 2024).

Participatory approaches have also been applied in mangrove rehabilitation programs, emphasizing community involvement in conservation management (Tomaquin, 2023). The use of *Avicennia* sp. and *Rhizophora* sp. in the activity was relevant to mangrove rehabilitation because these genera have complementary ecological characteristics in coastal environments. *Avicennia* sp. is generally associated with open and dynamic coastal substrates, while *Rhizophora* sp. develops prop-root structures that can contribute to sediment stabilization (Kathiresan & Bingham, 2001; Lovelock et al., 2024).

Objectives of the Activity

The activity was designed to address the identified need for continued mangrove conservation in Tanjung Pasir Village while providing a structured opportunity for stakeholder participation and environmental learning. In contrast to a planting activity conducted as a stand-alone intervention, the present program integrated learning, field action, reflection, and evaluation through the Participatory Learning and Action (PLA) approach.

Specifically, this activity aims to: (1) implement a community-based mangrove planting activity in Tanjung Pasir Village, Teluknaga Subdistrict, Tangerang Regency; (2) support coastal conservation efforts through the planting of 300 mangrove seedlings of *Avicennia* sp. and *Rhizophora* sp.; and (3) involve students and local community members in environmental conservation activities.

LITERATURE REVIEW

Mangrove Conservation and the Coastal Ecosystem

Mangroves are intertidal ecosystems that provide multiple ecological functions, including coastal protection, carbon storage, habitat provision, and support for biodiversity and human well-being. Recent ecological research emphasizes that the effectiveness of mangrove conservation and restoration depends on understanding ecological variation, species characteristics, and the interaction between mangroves, climate pressures, and human use of coastal areas (Lovelock et al., 2024).

Mangrove conservation also increasingly involves community-based approaches because local participation can contribute to stewardship, collective action, and longer-term management of coastal ecosystems. Recent reviews of community-based conservation and restoration in coastal wetlands emphasize the importance of involving local communities and strengthening post-restoration monitoring, rather than treating restoration as a one-time intervention (Moore & Kumble, 2024). Collaborative environmental governance similarly highlights community involvement, knowledge co-production, and collective action in caring for environmental resources (Diver et al., 2024).

Mangroves comprise various species with differing ecological characteristics. Two genera relevant to coastal conservation and rehabilitation in Indonesia are *Avicennia* sp. and *Rhizophora* sp. Their ecological characteristics should be considered when selecting species for rehabilitation, because mangrove species and assemblages differ in their responses to environmental conditions and in the ecosystem functions they provide (Kathiresan & Bingham, 2001; Lovelock et al., 2024). In the present activity, *Avicennia* sp. and *Rhizophora* sp. were selected because both genera are locally relevant and provide complementary characteristics for mangrove rehabilitation.

Local evidence further supports the relevance of mangrove conservation in the Teluknaga coastal area. Yumnaristya et al. (2023) examined the spatial and temporal distribution of mangrove carbon stocks in the Teluknaga coastal area of Tangerang, demonstrating the ecological value of mangrove vegetation in the local context. Studies of mangrove degradation in Indonesia also show that anthropogenic pressures remain important drivers of mangrove loss and associated environmental impacts (Eddy et al., 2021; Utami et al., 2024). At the national level, mangrove restoration is also linked to broader sustainable development objectives, including climate action and coastal ecosystem conservation (Sasmito et al., 2023).

Participatory Learning and Action (PLA)

Participatory Learning and Action (PLA) positions participants as active contributors to a process of learning, action, reflection, and evaluation. Rather than treating participants only as recipients of information, participatory approaches encourage the use of local experience, stakeholder interaction, and collective action in addressing community-level issues. Mishra et al. (2022), for example, applied PLA to examine community participation and used participatory techniques to identify resources, barriers, facilitators, and an action plan involving multiple local stakeholders.

In community-based environmental activities, the four PLA stages can be understood as an interconnected process. The Learn stage establishes shared understanding of environmental issues and the purpose of the activity. The Act stage translates that understanding into collective action and allows participants to contribute according to their respective roles. The Reflect stage provides an opportunity to discuss field experiences, observations, and lessons learned. The Evaluate stage focuses on reviewing implementation and identifying possible improvements and follow-up actions. This participatory logic is consistent with recent work emphasizing community involvement, knowledge co-production, and collective action in environmental governance (Diver et al., 2024).

Based on these principles, the present activity conceptualizes PLA as a sequential process connecting Learn, Act, Reflect, and Evaluate with expected knowledge development, stakeholder participation, shared learning, and follow-up orientation for community-based mangrove conservation. The framework distinguishes immediate program outputs from longer-term ecological outcomes that require follow-up monitoring. As illustrated in Figure 1, the four PLA stages are connected sequentially to expected knowledge development, stakeholder participation, shared learning, and follow-up orientation for community-based mangrove conservation.

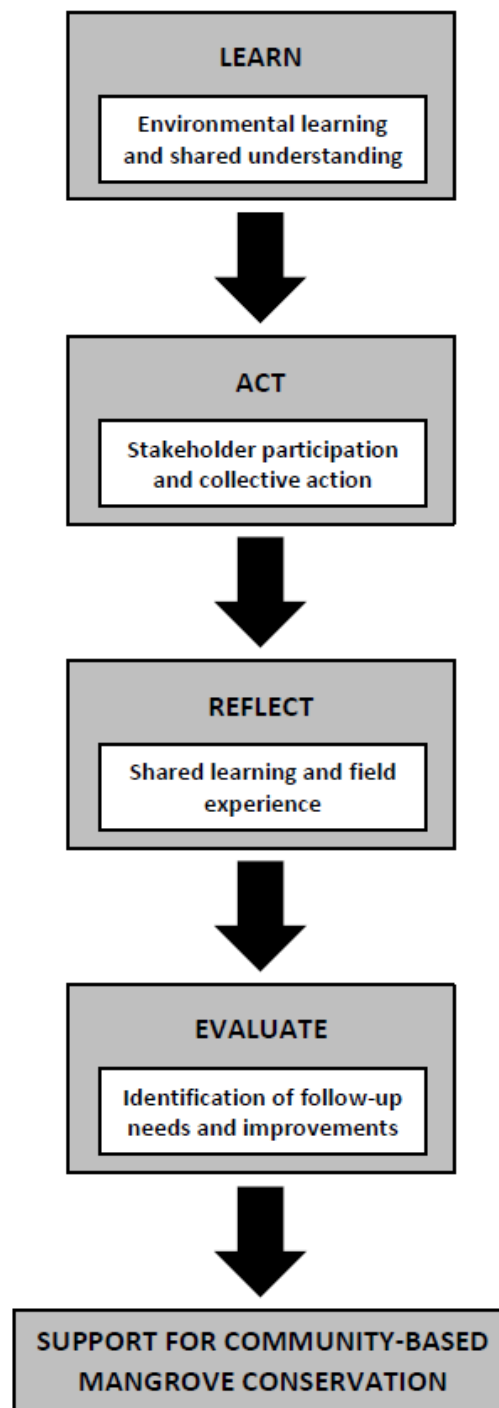


Figure 1. Conceptual Framework of PLA Implementation for Community-Based Mangrove Conservation

The activity was expected to generate immediate outputs in the form of completed mangrove planting, stakeholder involvement, and shared learning. Longer-term outcomes, including seedling survival, mangrove growth, and ecological recovery, require follow-up monitoring and therefore cannot be concluded from the present activity.

RESEARCH METHOD

The PLA Approach

This activity used the Participatory Learning and Action (PLA) approach, which emphasizes shared learning, active participation, field action, reflection, and evaluation. The approach was selected to structure the community service activity as a sequence of learning, action, reflection, and evaluation rather than as a planting activity alone. The stages of PLA used consisted of:

1. Learning (Learn): shared learning on climate change and mangrove conservation.
2. Action (Act): implementation of mangrove planting.
3. Reflection (Reflect): discussion and reflection on experiences during the activity.
4. Evaluation (Evaluate): evaluation of the activity's implementation and follow-up plans.

The four stages were implemented sequentially during the activity. Participant involvement differed according to the role of each stakeholder group and the activity stage, as described in Section 3.2 and Table 2.

Location, Time, and Participants

The activity was conducted in Tanjung Pasir Village, Teluknaga Subdistrict, Tangerang Regency, Banten Province, on May 31, 2026. The planting site was selected in coordination with the village government based on the availability of a designated coastal area for mangrove planting and its suitability for community-based conservation activities. Prior to planting, the activity team and local stakeholders conducted a direct visual observation of the designated area to identify the planting location and its general field conditions. No formal environmental assessment or quantitative baseline measurement was conducted before the activity. A total of 30 participants took part in the activity. The participants comprised 30 participants consisting of students from the first cohort of the Master of Management program of Matana University and their family members, representatives of the Tourism Awareness Group (Pokdarwis), local community members, and three representatives of the village government. Students and family members participated voluntarily, while local community members, village government representatives, and Pokdarwis were involved through coordination with the village head. The roles of the participant groups were distributed according to the needs of the activity. Students and family members attended the socialization session and participated in planting. Pokdarwis supported field coordination and documentation, local community members assisted with site preparation and technical aspects of planting, while village government representatives facilitated the planting location and provided the seedlings.

Participants were informed that photographs documenting the activity would be used for academic publication, and permission was obtained for the use of photographs in this article.

Table 1. Profile of the Community Service Activity

COMPONENT	DESCRIPTION
Location	Tanjung Pasir Village, Teluknaga Subdistrict, Tangerang Regency, Banten
Date	May 31, 2026
Institution	Matana University
Participants	30 people

Participant composition	The planting activity involved all 30 participants, comprising 9 students, 8 family members, 4 Pokdarwis representatives, 3 village government representatives, and 6 local community members
Seedlings	300 seedlings
Mangrove genera	<i>Avicennia</i> sp. and <i>Rhizophora</i> sp.

Implementation Stages Based on PLA

The implementation of this community service activity was designed based on the Participatory Learning and Action (PLA) approach, which emphasizes the active involvement of participants at every stage of the activity. This approach was implemented through four main stages: Learn, Act, Reflect, and Evaluate. Each stage was connected to the next so that the activity combined shared learning, field action, reflection on experience, and evaluation of implementation.

Table 2. Stages of Activity Implementation Based on the PLA Approach

PLA STAGE	TIME (WIB)	ACTIVITY
Learn	08.00 – 09.30	Participant registration, opening ceremony, and socialization on climate change and mangrove conservation
Act	09.30 – 12.00	Planting of 300 mangrove seedlings (<i>Avicennia</i> sp. and <i>Rhizophora</i> sp.)
Reflect	13.00 – 14.30	Joint discussion and reflection on experiences during the activity
Evaluate	14.30 – 15.00	Activity evaluation and closing

The learning stage was carried out through an educational session aimed at providing participants with an initial understanding of climate change and the importance of mangrove conservation. The session served as the shared-learning component before field action.

The action stage was realized through the planting of 300 mangrove seedlings of *Avicennia* sp. and *Rhizophora* sp. The seedlings were provided by the village government and were in good condition and ready for planting. No technical measurements of seedling age, height, or other physiological characteristics were recorded as part of the activity. Planting was carried out jointly by the participants under field guidance. The seedlings were secured to short bamboo supports using ties and were planted together with their polybags. Local community members assisted with site preparation and technical aspects of planting, while Pokdarwis supported coordination and documentation. Specific planting distance, planting depth, zonation, and tidal measurements were not systematically recorded during the activity. Planting was conducted at the designated site according to the field conditions and practical guidance provided during implementation.

The reflection stage involved participants from the different stakeholder groups in an open group discussion after the planting activity. Participants shared their experiences, field challenges, and lessons learned, allowing the experience of direct field action to be discussed collectively. No formal reflection instrument, questionnaire, or pre-test/post-test was used; the reflection relied on direct verbal exchange among participants. The discussion was guided by several topics, including participants' experiences during planting, field challenges, lessons learned, and possible follow-up actions for mangrove conservation.

The evaluation stage involved the participating stakeholder groups in an open discussion to review the implementation of the activity, challenges encountered during fieldwork, and possible follow-up actions for mangrove conservation. No structured evaluation instrument was administered, so the feedback was interpreted descriptively based on participants' verbal responses during the discussion. Participants' feedback was not recorded through formal transcripts, questionnaires, or a structured coding system. The feedback obtained during the open discussion was reviewed descriptively to identify recurring comments concerning participants' experiences, field challenges, lessons learned, and possible follow-up actions.

The implementation indicators comprised completion of the four PLA stages, participation of 30 participants, planting of 300 mangrove seedlings, and completion of the reflection and evaluation discussions. These indicators were used to assess implementation of the activity rather than long-term ecological impact. No systematic post-planting monitoring was conducted to assess seedling survival or growth. Therefore, longer-term ecological outcomes of the planting activity could not be assessed within this activity.

RESULTH AND DISCUSSION

Learning Stage

The learning stage was carried out through an educational session on climate change and the importance of mangrove conservation. The session involved participants from the different stakeholder groups in a shared learning process before the planting activity. The learning stage was conducted according to the activity schedule from 08.00 to 09.30 WIB, covering participant registration, the opening ceremony, and socialization on climate change and mangrove conservation. The session preceded the field planting activity and served as the learning component of the PLA process.

This approach is consistent with the participatory learning principles of PLA, in which participants engage in shared learning, discussion, and action planning (Mishra et al., 2022). Rahman et al. (2025) highlight the role of environmental education in mangrove conservation activities as a means of providing participants with knowledge about coastal environmental issues.



Figure 2. Participants at the Beginning of the Community Service Activity in Tanjung Pasir Village

Action Stage

The action stage was realized through the planting of 300 mangrove seedlings consisting of *Avicennia* sp. and *Rhizophora* sp. The activity involved 30 participants representing Master of Management students and family members, local community members, village government representatives, and Pokdarwis. Participants contributed according to their respective roles: students and family members participated in planting, local community members assisted with site preparation and practical planting activities, Pokdarwis supported field coordination and documentation, while village government representatives facilitated the planting location and provided the seedlings. The activity is documented in Figures 3-6, showing the participants displaying the seedlings prior to planting and their direct involvement throughout the planting process. The involvement of multiple stakeholder groups is consistent with participatory approaches reported in mangrove rehabilitation programs, where community participation is an important component of conservation management (Tomaquin, 2023).



Figure 3. Participants Displaying Mangrove Seedlings Prior To Planting

The activity used seedlings of *Avicennia* sp. and *Rhizophora* sp. provided by the village government. These genera have complementary ecological characteristics relevant to coastal environments. *Avicennia* sp. is generally associated with open and dynamic coastal substrates, while *Rhizophora* sp. develops prop-root structures that can contribute to sediment stabilization (Kathiresan & Bingham, 2001; Lovelock et al., 2024).



Figure 4. Participants Planting Mangrove Seedlings in the Coastal Area of Tanjung Pasir Village



Figure 5. Mangrove Seedling Planting Activity in the Designated Coastal Area of Tanjung Pasir Village



Figure 6. Participants Involved in the Mangrove Planting Activity

The selection of Tanjung Pasir Village as the activity location was also based on the condition of the coastal area, which continues to face various environmental pressures and requires ongoing conservation efforts. Hidayat et al. (2021) explain that the coastal area of Tanjung Pasir faces pressure due to changes in spatial use with the potential to affect coastal environmental conditions. In addition, Rosmaida (2025) shows that mangrove vegetation in Tanjung Pasir Village still requires attention in terms of conservation and rehabilitation efforts. At the national level, mangrove conservation is also a government priority in maintaining the sustainability of the coastal ecosystem, as reflected in the National Mangrove Map compiled (Rahmanto, 2020). The action stage was completed within the scheduled period of 09.30-12.00 WIB, with 300 seedlings planted. These findings demonstrate completion of the planned planting activity, but they do not establish ecological outcomes because seedling survival, growth, erosion reduction, biodiversity, and carbon-related changes were not measured.

Reflection Stage

The reflection stage was carried out after the mangrove planting activity had been completed. At this stage, participants took part in a joint discussion and reflection session to share experiences, convey the constraints they had faced during the activity, and discuss the lessons learned from carrying out the activity in the field.

During the open reflection discussion, participants identified the muddy terrain, changing tidal conditions, and the practical planting process as field experiences that required cooperation and coordination. Within the PLA approach, reflection provides an opportunity for participants to share experiences, identify challenges, and develop shared learning from the

activity (Mishra et al., 2022). The participation of students, family members, local community members, village government representatives, and Pokdarwis also illustrates how different stakeholder groups contributed to a shared environmental activity. This collaborative involvement is consistent with the emphasis on stakeholder participation and collective action in environmental governance (Diver et al., 2024).

Evaluation Stage

The evaluation stage was carried out to review the overall implementation of the activity, including the conformity of implementation with the activity plan, the constraints encountered, and the potential for developing future activities. Evaluation was conducted participatorily through joint discussion with participants. Within the PLA approach, evaluation can provide an opportunity to review the implementation process, participants' experiences, and possible follow-up actions (Mishra et al., 2022).

Evaluation also served as a means for participants to provide input regarding the implementation of the activity and opportunities for developing future conservation activities. Based on the evaluation discussion, similar conservation activities need to be continued through regular monitoring of mangrove growth and increased involvement of the community and higher education institutions. The importance of post-planting monitoring is supported by previous mangrove rehabilitation studies showing that seedling survival can vary according to environmental and methodological conditions and that restoration outcomes can be assessed through indicators such as survival, growth, and seedling health (Gorman et al., 2022; Kusmana & Rifana, 2023; Oktaviani et al., 2026).

Based on the implementation indicators, the planned activity sequence was completed, including the four PLA stages and the planting of 300 mangrove seedlings. The evaluation discussion also identified the need for continued monitoring and future stakeholder involvement.



Figure 7. Participants During the Closing Session of the Mangrove Planting Community Service Activity

Implications of the Activity for Coastal Conservation

The activity has implications primarily in terms of community participation, shared learning, and support for ongoing coastal conservation efforts. Because ecological outcomes were not quantitatively measured, the present activity should not be interpreted as evidence of changes in seedling survival, mangrove growth, erosion, biodiversity, or carbon storage.

Mangrove ecosystems provide important ecological functions, including coastal protection, habitat provision, and carbon storage (Lovelock et al., 2024). In Indonesia, mangrove restoration is also connected to broader sustainable development objectives (Sasmito et al., 2023). In the context of this activity, however, these functions represent the broader environmental rationale for mangrove conservation rather than measured outcomes of the planting activity.

From a social standpoint, the activity created an opportunity for students, family members, local residents, village officials, and Pokdarwis to participate in a shared environmental activity. Such stakeholder collaboration is consistent with the role of community participation and collaborative governance in environmental conservation (Diver et al., 2024; Moore & Kumble, 2024). The involvement of higher education participants also illustrates the potential of university-community collaboration in connecting learning with local sustainability initiatives (Lantang et al., 2024; Filho et al., 2023).

For Pokdarwis and other local stakeholders, the planted area may provide a basis for future community-based environmental education or ecotourism initiatives if the mangrove area is maintained and appropriately managed. Such a possibility represents a longer-term opportunity rather than an outcome demonstrated by the present activity, since no assessment of tourism use, visitor potential, or economic benefits was conducted.

The activity also aligns conceptually with SDG 13 (Climate Action) and SDG 14 (Life Below Water) through its focus on mangrove conservation and stakeholder participation (Sasmito et al., 2023). However, this alignment should be understood as a contribution at the activity level rather than a measured contribution to specific SDG indicators.

The present activity is comparable to previous community-based mangrove initiatives that combine environmental education, planting, and stakeholder participation. Tomaquin (2023) highlights the role of community participation in mangrove rehabilitation, while Lantang et al. (2024) documented collaboration among state and non-state actors in mangrove education and planting in Tanjung Pasir. The present activity similarly combined learning, field action, and stakeholder participation; however, unlike mangrove rehabilitation programs that incorporated post-planting monitoring, such as the assessment of seedling growth and biomass reported by Rahman et al. (2025), the present activity did not collect follow-up data on seedling survival or ecological change. Nevertheless, this article does not specifically measure the activity's contribution to the achievement of these SDG targets. Therefore, the implications discussed in this article are limited to the documented implementation, participant involvement, shared learning, and potential contribution to continued community-based conservation. Longer-term ecological and socio-economic outcomes require follow-up monitoring and assessment.

CONCLUSION

The community-based mangrove planting activity in Tanjung Pasir Village was implemented using the Participatory Learning and Action (PLA) approach through four stages: Learn, Act, Reflect, and Evaluate. The main output of the activity was the planting of 300 mangrove seedlings of *Avicennia* sp. and *Rhizophora* sp., involving 30 participants from

students and family members, local community members, village government representatives, and Pokdarwis. Beyond the planting activity itself, the practical contribution of the program was to integrate field action with shared learning, reflection, and evaluation, providing a structured community-based approach to mangrove conservation activities. However, this was a one-day activity and no follow-up monitoring was conducted to measure seedling survival, mangrove growth, erosion reduction, biodiversity, or other ecological changes. Therefore, the activity demonstrates completion of the planned community-based planting process and documents stakeholder participation and shared learning, rather than measurable ecological impacts.

RECOMMENDATIONS

Future activities should establish a post-planting maintenance and monitoring arrangement involving the village government, Pokdarwis, and the local community. Monitoring should be conducted at 1, 3, 6, and 12 months after planting, with indicators including seedling survival rate, seedling growth, physical condition, and the need for replanting or maintenance (Gorman et al., 2022; Kusmana & Rifana, 2023; Oktaviani et al., 2026). Pokdarwis and local community members can support field observation and documentation, while the village government can facilitate coordination and continuity of the monitoring activities.

Higher education institutions can also develop sustainable conservation activities through collaboration with the community and local stakeholders, whether in the form of community service activities, environmental education, or mangrove conservation monitoring and mentoring (Filho et al., 2023; Lantang et al., 2024). For Pokdarwis, the planted mangrove area could be developed as a community-based environmental education and potential ecotourism resource, provided that the mangrove vegetation is adequately maintained and its development is evaluated over time. Future higher-education community service programs can support this process through periodic mentoring, environmental education, monitoring assistance, and capacity building for local stakeholders.

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