



Building Regional Economic Resilience through AI Capability Orchestration

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Abstract

Artificial intelligence (AI) is increasingly recognized as a strategic driver of digital transformation and regional development; however, existing scholarship provides fragmented explanations of how AI investments translate into resilient regional economic outcomes. This conceptual paper addresses this theoretical gap by developing a middle-range theory that explains the mechanisms linking AI capability, ecosystem coordination, inclusive digital transformation, and regional economic resilience. Drawing on Dynamic Capabilities Theory, Resource Orchestration Theory, ecosystem perspectives, digital transformation research, and regional resilience literature, the study adopts an integrative conceptual synthesis to identify the missing causal mechanism underlying AI-enabled regional adaptation. The paper proposes AI Capability Orchestration Theory, which conceptualizes AI capability as a regionally embedded strategic capability whose developmental value emerges through deliberate coordination among heterogeneous ecosystem actors. The proposed framework specifies four core constructs, a sequential capability-development mechanism, contextual boundary conditions, and six theoretical propositions explaining how orchestrated AI capabilities foster inclusive digital transformation and subsequently strengthen regional economic resilience. By integrating previously disconnected theoretical perspectives into a coherent explanatory framework, this study advances theory development at the intersection of strategic management and regional development while providing a rigorous foundation for future empirical validation and comparative research on AI-enabled regional transformation.

Keywords

AI capability orchestration; regional economic resilience;
inclusive digital transformation; dynamic capabilities;
innovation ecosystems; middle-range theory

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1. Introduction

Artificial intelligence (AI) has rapidly evolved from a firm-level technological resource into a foundational infrastructure shaping digital transformation, industrial competitiveness, and regional economic development. Recent advances in generative AI, foundation models, intelligent automation, and data-driven decision systems have significantly expanded AI's strategic role beyond operational efficiency, enabling organizations and governments to redesign production systems, public services, innovation processes, and cross-sector collaboration. Consequently, AI is increasingly understood as a higher-order strategic capability that strengthens organizational learning, adaptive decision-making, and continuous capability renewal under conditions of technological turbulence rather than merely a collection of advanced algorithms (Bharadwaj *et al.*, 2013; Mikalef & Gupta, 2021; Verhoef *et al.*, 2021; Vial, 2019). Emerging evidence further suggests that sustainable value creation from AI depends less on technological sophistication than on the ability to integrate AI with complementary organizational resources, managerial cognition, governance structures, and ecosystem relationships, thereby transforming AI into an enduring source of adaptive capability and long-term competitiveness (Dwivedi *et al.*, 2023; Jöhnk *et al.*, 2021; Raisch & Krakowski, 2021).

Despite unprecedented global investment in AI infrastructure, national AI strategies, digital public services, and industrial digitalization initiatives, the developmental outcomes of these investments remain remarkably uneven across regions. Some regions have successfully leveraged AI to stimulate innovation, entrepreneurial dynamism, industrial diversification, and adaptive restructuring, whereas others continue to experience persistent productivity gaps, digital inequality, fragmented innovation systems, and limited resilience against economic and technological shocks (Brynjolfsson *et al.*, 2021; Coyle, 2022; Martin & Sunley, 2015). This disparity suggests that technological investment alone is insufficient to generate resilient regional development. Instead, the developmental impact of AI depends on the institutional capacity to coordinate complementary resources, facilitate knowledge diffusion, and enable collaborative capability development across diverse regional actors. Recent studies on AI readiness similarly argue that digital infrastructure, governance quality, human capital, and institutional collaboration jointly determine whether AI investments produce broad-based socioeconomic benefits rather than isolated technological advances (OECD, 2024; World Economic Forum, 2024).

The importance of this issue has intensified as regional economies simultaneously confront multiple structural disruptions, including rapid technological change, geopolitical fragmentation, supply-chain reconfiguration, demographic transitions, climate-related uncertainty, and accelerating digital competition. Accordingly, contemporary resilience scholarship has moved beyond conceptualizing resilience as merely the capacity to recover from crises toward viewing it as a dynamic developmental capability through which regions anticipate change, reorganize institutional arrangements, renew industrial structures, and continuously adapt to evolving environmental conditions (Boschma, 2015; Martin, 2012; Pendall *et al.*, 2010). Within this perspective, AI should not simply be regarded as another productivity-enhancing technology. Rather, its strategic significance lies in its ability to strengthen collective learning, enhance institutional coordination, facilitate cross-sector knowledge integration, and support adaptive regional transformation. Consequently, the central question is no longer whether AI contributes to regional development, but how AI-enabled capabilities can be deliberately coordinated to generate resilient, inclusive, and sustainable regional economies.

Existing scholarship has produced substantial advances in understanding AI capability, digital transformation, and regional resilience. Research on digital transformation demonstrates that digital technologies fundamentally reshape organizational routines, governance arrangements, business models, and inter-organizational collaboration, thereby

altering the mechanisms through which value is created and sustained (Bharadwaj *et al.*, 2013; Verhoef *et al.*, 2021; Vial, 2019). Parallel developments in AI research increasingly conceptualize AI capability as a higher-order organizational capability comprising data resources, analytical competence, computational infrastructure, managerial expertise, and organizational learning that collectively enhance innovation and strategic decision-making (Duan *et al.*, 2019; Mikalef & Gupta, 2021; Raisch & Krakowski, 2021). Meanwhile, regional resilience literature emphasizes industrial diversity, institutional quality, innovation systems, and evolutionary adaptation as fundamental drivers of regional competitiveness under uncertainty (Boschma, 2015; Isaksen & Trippl, 2016; Martin, 2012). More recent studies further recognize that digital transformation increasingly unfolds through interconnected innovation ecosystems in which public institutions, firms, universities, and civil society jointly shape technological development and knowledge diffusion (Autio & Thomas, 2022; Nambisan *et al.*, 2019). Nevertheless, these research streams have evolved largely in parallel, providing only fragmented explanations of how AI-enabled capabilities become translated into resilient regional development.

This fragmentation reflects a deeper theoretical limitation concerning the locus and coordination of capability development. AI capability research remains predominantly organization-centric, emphasizing firm performance, innovation, and competitive advantage while paying comparatively limited attention to broader territorial consequences (Mikalef & Gupta, 2021; Raisch & Krakowski, 2021). Digital transformation research explains how organizations redesign structures and business models through digital technologies but offers relatively little insight into the mechanisms through which digitally enabled capabilities become coordinated across organizational boundaries to strengthen regional adaptive systems (Verhoef *et al.*, 2021; Vial, 2019). Conversely, regional resilience scholarship provides sophisticated explanations based on industrial evolution, institutional diversity, and regional innovation systems, yet AI is generally treated as an enabling contextual factor rather than as a strategic capability whose deliberate configuration may fundamentally reshape regional adaptive capacity (Boschma, 2015; Isaksen & Trippl, 2016). Consequently, existing explanations remain bounded within disciplinary perspectives, making it difficult to explain why regions exhibiting comparable levels of AI investment frequently experience markedly different developmental trajectories.

Theoretical perspectives within strategic management also reveal a similar gap. The Resource-Based View, Dynamic Capabilities Theory, and Resource Orchestration Theory explain how organizations create value by acquiring, integrating, and reconfiguring valuable resources under changing competitive conditions (Barney, 1991; Sirmon *et al.*, 2011; Teece, 2007). Likewise, ecosystem perspectives demonstrate that innovation increasingly emerges through interactions among heterogeneous actors possessing complementary capabilities and shared governance arrangements (Adner, 2017; Jacobides *et al.*, 2018). However, these perspectives remain primarily concerned with organizational competitiveness or ecosystem value creation and provide limited explanation regarding how distributed AI capabilities become intentionally coordinated across firms, governments, universities, financial institutions, and innovation intermediaries to generate adaptive regional outcomes. As a result, the literature still lacks a meso-level explanatory mechanism capable of integrating AI capability, ecosystem coordination, inclusive digital transformation, and regional economic resilience within a coherent theoretical framework.

This study argues that the missing mechanism resides in AI Capability Orchestration. Rather than conceptualizing AI capability as a firm-specific technological asset, we define it as a regionally embedded strategic capability whose developmental value emerges through deliberate coordination among heterogeneous ecosystem actors. AI Capability Orchestration refers to the continuous process of aligning strategic priorities, integrating complementary AI-related resources, facilitating ecosystem learning, and synchronizing institutional arrangements to transform fragmented technological capabilities into collective adaptive

capacity. Building upon Dynamic Capabilities Theory, Resource Orchestration Theory, ecosystem perspectives, digital transformation research, and regional resilience scholarship, this paper develops AI Capability Orchestration Theory as a new middle-range theory explaining how orchestrated AI capabilities foster inclusive digital transformation and subsequently strengthen regional economic resilience. Specifically, the study pursues three objectives: (1) synthesizing fragmented literature across strategic management, AI capability, digital transformation, ecosystem research, and regional resilience to identify the unresolved theoretical gap; (2) developing an integrative conceptual mechanism explaining how AI Capability Orchestration enables inclusive digital transformation within regional innovation ecosystems; and (3) proposing a novel middle-range theory specifying the core constructs, causal mechanisms, boundary conditions, and theoretical propositions linking AI Capability Orchestration to regional economic resilience. By introducing orchestration as the missing explanatory mechanism connecting previously disconnected theoretical domains, this study provides a stronger foundation for cumulative theory development and future empirical research while offering a theoretically grounded perspective for understanding how regions can translate AI investments into resilient, adaptive, and inclusive economic development.

2. Theoretical Foundations

2.1 Dynamic Capability Perspective

The strategic value of artificial intelligence (AI) has shifted the focus of strategic management from static resource ownership toward continuous capability renewal. The Resource-Based View (RBV) argues that organizations achieve sustained competitive advantage through valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Although RBV remains foundational for explaining performance heterogeneity, its relatively static assumptions provide limited insight into organizational adaptation under accelerating technological change. AI-intensive environments are characterized by rapid knowledge obsolescence, evolving digital ecosystems, and continuous data generation, requiring organizations to repeatedly reconfigure resources rather than merely possess superior assets.

Dynamic Capabilities Theory addresses this limitation by emphasizing an organization's ability to sense opportunities, seize them through strategic decisions, and transform resource configurations in response to environmental turbulence (Teece, 2007; Teece *et al.*, 1997). Unlike operational capabilities that support routine efficiency, dynamic capabilities enable strategic renewal through continuous learning, experimentation, and capability reconfiguration (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Helfat & Winter, 2011). Recent AI scholarship reinforces this perspective by suggesting that competitive advantage increasingly depends on the capability to integrate AI into organizational learning, decision-making, and innovation processes rather than on algorithmic sophistication alone (Jöhnk *et al.*, 2021; Mikalef & Gupta, 2021; Raisch & Krakowski, 2021).

Resource Orchestration Theory further extends dynamic capabilities by arguing that value creation depends not only on resource availability but also on managerial actions that structure, bundle, and leverage complementary resources (Sirmon *et al.*, 2007, 2011). Similarly, Dynamic Managerial Capabilities emphasize managerial cognition, social capital, and decision-making as essential mechanisms through which organizations deploy strategic resources under uncertainty (Adner & Helfat, 2003). Recent studies on AI-enabled organizations similarly demonstrate that AI capability emerges from coordinated interactions among technological infrastructure, human expertise, governance mechanisms, and organizational routines rather than from technology investment alone (Dwivedi *et al.*, 2023; Mikalef *et al.*, 2022). Accordingly, AI capability should be viewed as a higher-order dynamic

capability that continuously evolves through data integration, organizational learning, and strategic adaptation.

Despite these advances, Dynamic Capabilities Theory remains predominantly organization-centric. Existing studies largely explain how individual firms create competitive advantage through capability development while paying comparatively limited attention to how AI capabilities are coordinated across multiple organizations within regional innovation systems. Consequently, the theory provides only a partial explanation of how distributed AI resources collectively strengthen regional adaptive capacity. This limitation motivates extending capability development beyond organizational boundaries toward an ecosystem-level orchestration perspective.

2.2 Digital Transformation Perspective

Digital transformation has evolved from organizational digitization into a multidimensional process that reshapes value creation, governance, institutional arrangements, and inter-organizational collaboration. Rather than representing the adoption of digital technologies alone, digital transformation fundamentally alters how organizations generate, exchange, and utilize knowledge across increasingly interconnected ecosystems (Bharadwaj *et al.*, 2013; Verhoef *et al.*, 2021; Vial, 2019).

Digital innovation literature attributes this transformation to the distinctive characteristics of digital technologies, including reprogrammability, modularity, data homogenization, and network connectivity, which enable continuous innovation beyond organizational boundaries (Yoo *et al.*, 2010). Consequently, innovation increasingly emerges through digitally connected ecosystems involving firms, governments, universities, technology providers, financial institutions, and users rather than through isolated organizations. Ecosystem-oriented perspectives similarly argue that digital transformation is inherently collaborative because technological value depends on complementary capabilities distributed across multiple actors (Adner, 2017; Autio & Thomas, 2022; Jacobides *et al.*, 2018)

Recent scholarship further emphasizes that successful AI-enabled transformation requires organizational capabilities extending beyond technology deployment. Leadership commitment, digital governance, responsible AI practices, data governance, workforce capabilities, and institutional collaboration jointly determine whether AI contributes to sustainable organizational and societal outcomes (Dwivedi *et al.*, 2023; Jöhnk *et al.*, 2021). Consequently, digital transformation should be understood as a socio-technical process in which technological innovation and institutional change evolve simultaneously.

The literature on inclusive innovation provides an important complementary perspective. Innovation should not only improve productivity but also broaden participation, reduce inequality, and increase access to technological opportunities among diverse socioeconomic groups (Foster & Heeks, 2013; George *et al.*, 2012). More recent discussions concerning responsible AI similarly emphasize fairness, accessibility, transparency, and societal inclusion as central dimensions of sustainable digital transformation (OECD, 2024; UNESCO, 2021). These developments suggest that digital transformation generates long-term developmental value only when technological progress is accompanied by institutional inclusiveness and equitable capability diffusion.

Nevertheless, existing digital transformation research continues to emphasize organizational performance, business model innovation, and technological modernization while providing comparatively limited explanation regarding how AI-enabled capabilities become coordinated across regional ecosystems to support adaptive regional development. Accordingly, although ecosystem perspectives recognize interdependence among heterogeneous actors, the literature still lacks an integrative mechanism explaining how coordinated AI capability generates inclusive digital transformation and subsequently contributes to regional economic resilience.

2.3 Regional Economic Resilience Perspective

Regional economic resilience has become a central concept in understanding how regions respond to accelerating technological disruption, economic crises, environmental uncertainty, and geopolitical change. Early resilience research defined resilience as the capacity of systems to absorb disturbances while maintaining essential functions (Holling, 1973). Subsequent scholarship expanded this perspective by emphasizing adaptation, transformation, and continuous system renewal rather than simple recovery following external shocks (Folke, 2006).

Within regional development studies, resilience refers to the capability of regional economies to resist disruption, recover from crises, adapt institutional arrangements, and transform industrial structures while sustaining long-term socioeconomic development (Martin, 2012; Pendall *et al.*, 2010). Contemporary resilience research increasingly adopts an evolutionary perspective, arguing that resilient regions continuously generate new development pathways through innovation, institutional learning, and industrial diversification rather than returning to previous equilibrium states (Boschma, 2015; Martin & Sunley, 2015)

Evolutionary economic geography further explains that adaptive capacity depends on diversified industrial structures, knowledge networks, institutional quality, and regional innovation systems capable of supporting continuous capability renewal (Boschma, 2015; Isaksen & Trippl, 2016). Complementing this perspective, mission-oriented innovation research highlights the strategic role of governments in coordinating innovation ecosystems through industrial policy, regulatory frameworks, public investment, and cross-sector collaboration aimed at addressing complex societal challenges (Kattel & Mazzucato, 2018; Mazzucato, 2018). These perspectives collectively indicate that regional resilience is fundamentally shaped by coordinated institutional and technological development rather than market dynamics alone.

Recent digital economy research increasingly recognizes AI as an important driver of regional transformation through productivity enhancement, knowledge creation, entrepreneurial innovation, and public-sector modernization. However, AI is generally treated as a contextual technological enabler rather than as a strategic capability embedded within regional governance and innovation systems. Consequently, existing resilience literature provides limited theoretical explanation regarding how distributed AI capabilities become coordinated to strengthen collective adaptive capacity. This omission becomes increasingly significant as regional competitiveness depends not only on technological investment but also on institutional capability to mobilize complementary knowledge, digital infrastructure, and ecosystem collaboration.

2.4 Existing Explanations and Theoretical Limitations

Dynamic Capabilities Theory, digital transformation research, ecosystem perspectives, and regional resilience literature have each substantially advanced understanding of technological adaptation and regional development. However, these streams remain analytically fragmented because they explain complementary aspects of the same phenomenon while employing different units of analysis and causal assumptions. Dynamic Capabilities Theory primarily explains organizational adaptation through capability reconfiguration (Teece, 2007), digital transformation literature focuses on technology-enabled organizational change (Verhoef *et al.*, 2021; Vial, 2019), ecosystem research emphasizes collaborative value creation among heterogeneous actors (Adner, 2017; Jacobides *et al.*, 2018), and regional resilience scholarship explains adaptive regional development through institutional diversity and evolutionary change (Boschma, 2015; Martin, 2012)

Collectively, these perspectives demonstrate that resources, capabilities, ecosystems, and institutions all contribute to adaptive performance. Nevertheless, they provide only limited

explanation regarding the coordination processes through which distributed AI capabilities become strategically aligned across regional innovation ecosystems. Existing theories explain resource ownership, organizational capability, collaborative interaction, or regional adaptation independently but stop short of identifying the mechanism that intentionally integrates these elements into sustained regional resilience. Consequently, the literature lacks a meso-level theoretical framework capable of connecting AI capability, ecosystem coordination, inclusive digital transformation, and regional economic resilience through a common causal mechanism.

This unresolved gap is increasingly important because AI-enabled regional development depends not solely on technological advancement but on the collective ability of governments, firms, universities, research organizations, financial institutions, and innovation intermediaries to coordinate complementary resources under conditions of uncertainty. The present study therefore proposes AI Capability Orchestration as the missing theoretical mechanism. By integrating insights from Dynamic Capabilities Theory, Resource Orchestration Theory, digital transformation research, ecosystem perspectives, and regional resilience scholarship, the proposed framework shifts analytical attention from technology adoption toward coordinated capability deployment across regional innovation ecosystems. In doing so, it establishes the theoretical foundation for the middle-range theory developed in the subsequent section.

The complementary strengths and limitations of existing theoretical perspectives can be systematically compared to clarify the distinctive contribution of the proposed theory and justify its conceptual development.

Table 1. Comparison of Existing Theoretical Perspectives and AI Capability Orchestration Theory

Existing Perspective	Primary Unit of Analysis	Main Theoretical Focus	Key Limitation	Proposed Contribution
Resource-Based View (RBV)	Firm	Strategic resources as sources of competitive advantage	Static resource ownership; limited explanation of capability renewal and regional coordination	Reinterprets AI capability as a distributed regional strategic resource requiring ecosystem orchestration
Dynamic Capabilities Theory	Firm	Sensing, seizing, and transforming organizational capabilities	Primarily organization-centric with limited cross-organizational coordination	Extends dynamic capabilities to coordinated capability development across regional ecosystems
Resource Orchestration Theory	Firm	Managerial structuring, bundling, and leveraging of resources	Focuses on intra-organizational orchestration	Expands orchestration toward ecosystem-level coordination among heterogeneous regional actors
Digital Transformation Research	Organization	Technology-enabled organizational transformation	Emphasizes organizational modernization rather than regional adaptive development	Positions inclusive digital transformation as an ecosystem-wide developmental process

Existing Perspective	Primary Unit of Analysis	Main Theoretical Focus	Key Limitation	Proposed Contribution
Innovation Ecosystem Perspective	Ecosystem	Collaboration and value co-creation among complementary actors	Limited explanation of coordinated capability deployment for regional resilience	Introduces orchestration as the mechanism integrating complementary AI capabilities across the ecosystem
Regional Economic Resilience Perspective	Region	Adaptation, renewal, and long-term regional development	AI generally treated as an enabling contextual factor	Positions AI capability as a strategic antecedent of adaptive regional resilience through orchestration
AI Capability Orchestration Theory (Proposed)	Regional Innovation Ecosystem	Coordinated deployment of distributed AI capabilities to foster inclusive digital transformation and regional resilience	Addresses the fragmented explanations across existing perspectives through an integrated meso-level causal mechanism	Provides a middle-range theory linking AI capability, ecosystem coordination, inclusive digital transformation, and regional economic resilience

Source: Developed by the authors based on Barney (1991); Teece et al. (1997); Teece (2007); Sirmon et al. (2011); Bharadwaj et al. (2013); Adner (2017); Jacobides et al. (2018); Vial (2019); Martin (2012); Boschma (2015); Isaksen and Trippel (2016); Mikalef and Gupta (2021); and Raisch and Krakowski (2021).

Table 1 demonstrates that existing theories provide complementary but partial explanations of AI-enabled regional transformation. While each perspective contributes important insights regarding resources, capabilities, digital transformation, ecosystems, or resilience, none explicitly explains how distributed AI capabilities are strategically coordinated across regional actors. The proposed theory integrates these perspectives by introducing AI Capability Orchestration as the missing meso-level mechanism linking technological capability with resilient regional development.

To synthesize the fragmented theoretical perspectives discussed above, Figure 1 illustrates how the five foundational theories are conceptually integrated into AI Capability Orchestration Theory. The figure highlights the missing explanatory mechanism that connects previously disconnected streams of research into a coherent middle-range theoretical framework.

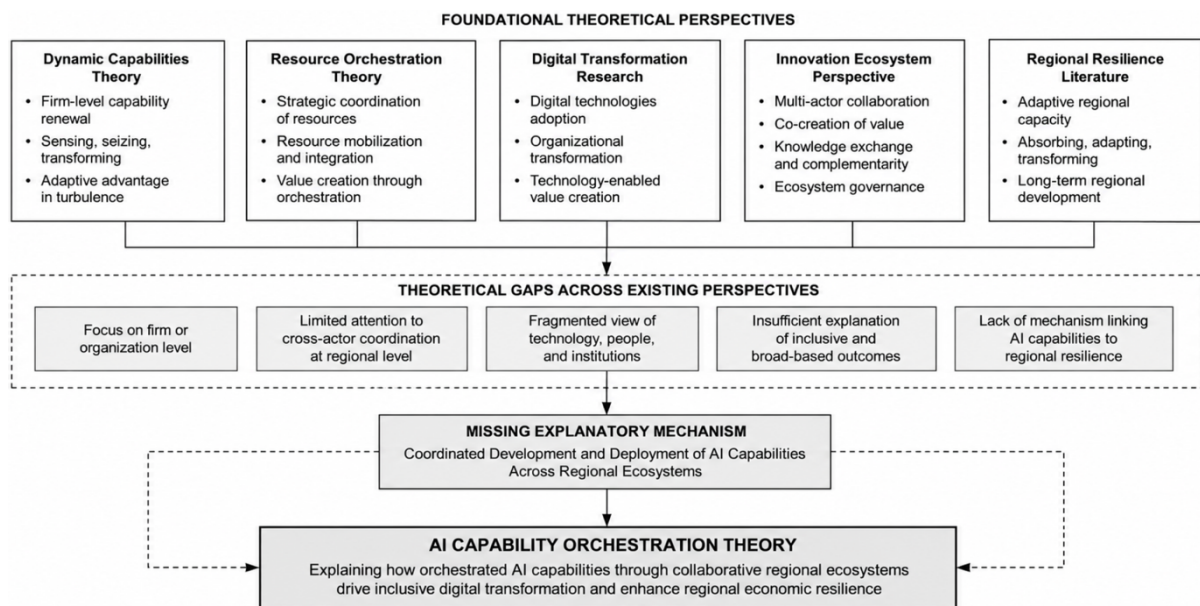


Figure 1. Theoretical Integration Underlying AI Capability Orchestration Theory

Source: Developed by the authors based on Barney (1991); Teece et al. (1997); Teece (2007); Sirmon et al. (2011); Adner (2017); Jacobides et al. (2018); Bharadwaj et al. (2013); Vial (2019); Verhoef et al. (2021); Martin (2012); Boschma (2015); and Isaksen and Trippl (2016).

Figure 1 demonstrates that AI Capability Orchestration Theory does not replace existing theoretical perspectives but instead integrates their complementary strengths into a unified explanatory framework. Dynamic capabilities explain capability renewal, resource orchestration emphasizes coordination, digital transformation describes technological change, ecosystem theory highlights inter-organizational collaboration, and regional resilience explains adaptive development. AI Capability Orchestration is proposed as the missing mechanism connecting these perspectives into a coherent explanation of resilient regional transformation.

3. Theory Building: AI Capability Orchestration Theory

3.1 Domain Specification

The proposed AI Capability Orchestration Theory is developed to explain how artificial intelligence (AI) capabilities become a source of regional economic resilience through coordinated capability deployment across heterogeneous actors within regional innovation ecosystems. Unlike conventional strategic management theories that primarily explain firm-level competitiveness, the present theory explicitly positions the regional innovation ecosystem as the principal unit of analysis. Regional resilience is therefore conceptualized as an emergent outcome arising from continuous interactions among firms, governments, universities, research institutions, digital infrastructure providers, financial intermediaries, entrepreneurial organizations, and civil society rather than from isolated organizational capabilities.

The theory is situated within regions undergoing substantial digital transformation where AI increasingly shapes industrial production, public services, entrepreneurial activity, knowledge creation, and institutional governance. Under these conditions, AI capability extends beyond organizational technology adoption and becomes a distributed regional asset embedded within interconnected networks of knowledge, infrastructure, policy, and innovation. Consequently, regional competitiveness depends less on the quantity of AI investment than on the collective capacity to coordinate complementary technological, institutional, informational, and human resources across ecosystem participants.

This perspective departs from technology-centric explanations by assuming that AI technologies are inherently complementary rather than self-sufficient strategic resources. Their developmental value depends on interactions with institutional quality, digital infrastructure, governance capacity, human capital, knowledge-sharing mechanisms, and collaborative learning processes (Adner, 2017; Dwivedi *et al.*, 2023; Jacobides *et al.*, 2018). Accordingly, regions possessing similar technological investments may experience markedly different developmental trajectories because orchestration capability—not technological ownership alone—determines whether AI resources are transformed into collective adaptive capacity.

The explanatory scope of the theory is intentionally bounded. It is designed to explain regional economic resilience under conditions characterized by rapid technological change, institutional complexity, and ecosystem interdependence. It does not seek to explain firm profitability, individual technology adoption decisions, or macroeconomic growth independently. Instead, it occupies a meso-level analytical position linking organizational capability development with regional adaptive outcomes through ecosystem coordination. In this sense, AI Capability Orchestration Theory complements rather than replaces Dynamic Capabilities Theory and Regional Resilience Theory by introducing orchestration as the integrative mechanism connecting AI capability with inclusive regional transformation.

3.2 Core Constructs

The proposed theory consists of four interrelated constructs that collectively explain how AI contributes to resilient regional development.

1) AI Capability

AI capability refers to the collective regional capacity to acquire, develop, integrate, and continuously enhance AI-related resources across interconnected organizations. Existing literature generally conceptualizes AI capability as an organizational competence comprising data resources, computational infrastructure, analytical expertise, managerial capability, and organizational learning (Mikalef & Gupta, 2021; Raisch & Krakowski, 2021). This study extends the construct by redefining AI capability as a distributed regional capability embedded within an ecosystem rather than a firm-specific resource.

At the regional level, AI capability encompasses shared digital infrastructure, AI research centers, innovation laboratories, regional data ecosystems, digital talent, collaborative research networks, and public innovation initiatives. These complementary assets collectively determine the technological potential available to the regional ecosystem. Consequently, AI capability represents the accumulated technological and knowledge resources that can potentially support regional adaptation but do not automatically generate resilient development without effective coordination.

2) AI Capability Orchestration

The central construct of the proposed theory is AI Capability Orchestration, defined as the deliberate and continuous process through which heterogeneous regional actors strategically coordinate, integrate, align, and reconfigure distributed AI-related capabilities to generate collective adaptive outcomes.

Although Resource Orchestration Theory explains managerial coordination within firms (Sirmon *et al.*, 2007, 2011), AI Capability Orchestration extends this logic beyond organizational boundaries. Orchestration occurs through collaborative governance involving governments, industries, universities, research organizations, digital infrastructure providers, financial institutions, and intermediary organizations. Rather than maximizing individual organizational performance, orchestration seeks to optimize ecosystem-wide learning, capability complementarities, and institutional coordination.

The construct comprises four mutually reinforcing dimensions.

- a. Strategic Alignment refers to the development of shared regional priorities regarding AI investment, innovation strategy, and long-term digital transformation.
- b. Resource Integration denotes the coordinated mobilization and combination of complementary technological, financial, informational, and human resources across ecosystem actors.
- c. Ecosystem Learning reflects continuous knowledge creation, inter-organizational learning, experimentation, and capability diffusion throughout the regional innovation system.
- d. Institutional Synchronization refers to the alignment of governance arrangements, regulatory frameworks, public policies, standards, and collaborative institutions that enable coordinated AI deployment.

Collectively, these dimensions explain how fragmented AI resources become ecosystem-level adaptive capabilities rather than isolated technological assets.

3) Inclusive Digital Transformation

Inclusive Digital Transformation represents the intermediate mechanism through which orchestrated AI capability generates regional development.

Unlike conventional digital transformation perspectives emphasizing organizational modernization (Verhoef *et al.*, 2021; Vial, 2019), the present study conceptualizes inclusive digital transformation as ecosystem-wide digital development that simultaneously enhances innovation, expands participation, reduces digital inequality, and strengthens access to technological opportunities across organizations and communities.

The construct therefore incorporates both technological efficiency and developmental inclusiveness. It captures the extent to which AI capabilities diffuse beyond technologically advanced firms toward SMEs, educational institutions, local governments, entrepreneurial communities, and underserved populations. In doing so, inclusive digital transformation becomes the principal developmental pathway connecting AI Capability Orchestration with regional resilience.

4) Regional Economic Resilience

Regional Economic Resilience constitutes the ultimate outcome of the proposed theory.

Consistent with evolutionary regional development literature (Boschma, 2015; Martin, 2012), resilience is conceptualized as the capability of regional economies to anticipate disruption, absorb external shocks, reorganize institutional arrangements, renew industrial structures, and sustain long-term socioeconomic development under conditions of uncertainty.

Importantly, resilience is viewed as a dynamic developmental capability rather than a post-crisis recovery outcome. Highly resilient regions continuously diversify economic activities, strengthen innovation systems, attract investment, facilitate entrepreneurial experimentation, and generate sustainable employment despite technological and institutional disruption. Within the proposed framework, resilience emerges not directly from AI technologies but from sustained orchestration processes that transform dispersed AI capabilities into inclusive regional transformation.

3.3 Mechanism Development

The central proposition of AI Capability Orchestration Theory is that AI capability alone does not produce regional economic resilience. Instead, resilience emerges through a sequential orchestration process that progressively transforms dispersed technological resources into coordinated regional adaptive capacity.

The process begins with AI capability accumulation, during which firms, universities, governments, and technology providers independently develop AI-related resources, including digital infrastructure, data assets, analytical expertise, research capability, and AI-enabled organizational routines. At this stage, technological capability remains fragmented because complementary resources are distributed across multiple organizations. Although individual actors may improve organizational performance, isolated capability development rarely produces systemic regional resilience due to limited coordination and knowledge integration.

The second stage involves AI Capability Orchestration, where ecosystem actors intentionally coordinate complementary resources through collaborative governance, public-private partnerships, knowledge-sharing arrangements, institutional alignment, and strategic ecosystem management. Through orchestration, fragmented technological assets become integrated regional capabilities. Knowledge flows more efficiently across organizational boundaries, complementary investments are synchronized, and institutional actors collectively strengthen regional innovation capacity. Consequently, ecosystem performance increasingly reflects coordinated capability deployment rather than the aggregate performance of individual organizations.

The third stage is Inclusive Digital Transformation. As orchestrated AI capabilities become embedded within regional innovation systems, digital technologies diffuse more broadly across sectors, industries, organizational forms, and social groups. SMEs obtain greater access to AI-enabled services, universities accelerate technology transfer, governments improve digital public services, entrepreneurial ecosystems expand innovation opportunities, and marginalized communities experience greater inclusion within digital development processes. Consequently, digital transformation evolves from organizational modernization toward ecosystem-wide capability enhancement.

The final stage is Regional Economic Resilience. Inclusive digital transformation strengthens adaptive capacity by increasing industrial diversification, institutional flexibility, collaborative problem-solving, and continuous innovation. Regions characterized by strong orchestration capability become better equipped to anticipate technological disruption, reallocate strategic resources, facilitate industrial renewal, and sustain long-term development under persistent uncertainty. Accordingly, resilience should be understood as an emergent property of coordinated ecosystem capability rather than the direct consequence of technological investment.

The proposed mechanism therefore introduces orchestration as the missing causal process linking AI capability with resilient regional development. AI technologies create sustainable developmental value only after they become institutionally coordinated capabilities embedded within collaborative regional ecosystems.

3.4 Boundary Conditions

Although AI Capability Orchestration Theory proposes a general explanatory mechanism, its effectiveness depends upon several contextual conditions.

First, digital infrastructure determines the extent to which data, knowledge, and AI services can circulate efficiently throughout the regional ecosystem. Weak digital connectivity and fragmented technological infrastructure constrain capability integration regardless of technological investment.

Second, institutional quality shapes collaborative governance among governments, industries, universities, and intermediary organizations. Effective institutions facilitate trust, policy coordination, regulatory consistency, and long-term ecosystem collaboration.

Third, human capital determines regional absorptive capacity. AI technologies require skilled professionals capable of integrating technological innovation into organizational routines,

public administration, and entrepreneurial activities. Regions lacking digital competencies are unlikely to transform technological investment into adaptive development.

Fourth, AI governance influences responsible AI deployment through transparency, accountability, interoperability, ethical standards, and data governance. Weak governance reduces public trust and limits ecosystem-wide capability coordination.

Finally, ecosystem diversity strengthens resilience by increasing knowledge variety, innovation complementarities, and adaptive flexibility, whereas digital inequality constrains technology diffusion and weakens the developmental benefits generated through orchestration.

These contextual conditions indicate that identical AI investments may produce substantially different regional outcomes depending upon the surrounding institutional and ecosystem environment.

3.5 Proposition Development

Building upon the preceding theoretical arguments, six propositions are advanced.

Proposition 1.

Regional AI capability positively increases the potential for AI Capability Orchestration but does not directly generate Regional Economic Resilience.

Proposition 2.

AI Capability Orchestration mediates the positive relationship between Regional AI Capability and Inclusive Digital Transformation.

Proposition 3.

Inclusive Digital Transformation mediates the positive relationship between AI Capability Orchestration and Regional Economic Resilience.

Proposition 4.

Higher institutional quality strengthens the positive effect of AI Capability Orchestration on Inclusive Digital Transformation.

Proposition 5.

Digital infrastructure and human capital positively moderate the relationship between Inclusive Digital Transformation and Regional Economic Resilience.

Proposition 6.

Digital inequality weakens the positive relationship between AI Capability Orchestration and Regional Economic Resilience by limiting the diffusion of AI-enabled capabilities across the regional ecosystem.

These propositions establish a coherent middle-range theoretical framework linking distributed AI capability, ecosystem coordination, inclusive digital transformation, and resilient regional development while specifying the contextual conditions under which the proposed mechanism is expected to operate.

The proposed theoretical arguments converge into an integrated conceptual framework illustrating the sequential relationships among the principal constructs, contextual conditions, and expected developmental outcomes of AI Capability Orchestration Theory.

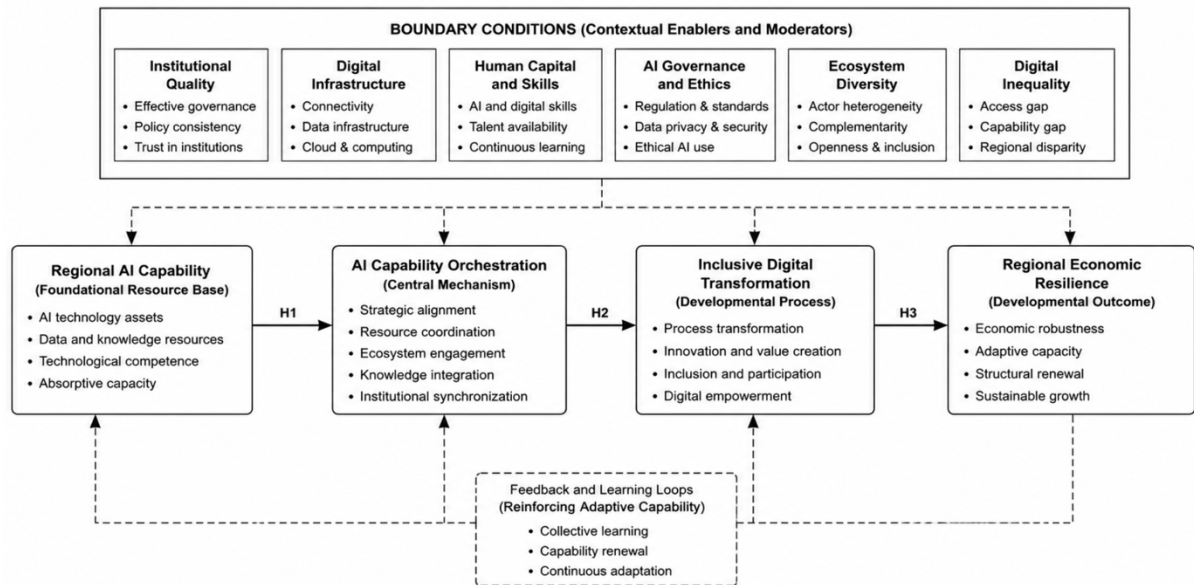


Figure 2. Conceptual Framework of AI Capability Orchestration Theory

Source: Developed by the authors based on Barney (1991); Teece et al. (1997); Teece (2007); Sirmon et al. (2011); Bharadwaj et al. (2013); Vial (2019); Adner (2017); Jacobides et al. (2018); Martin (2012); Boschma (2015); Mikalef and Gupta (2021); Raisch and Krakowski (2021).

Figure 2 illustrates the complete causal architecture of AI Capability Orchestration Theory. Regional AI Capability provides the foundational resource base, while AI Capability Orchestration functions as the central coordinating mechanism that enables Inclusive Digital Transformation and ultimately strengthens Regional Economic Resilience. The framework further highlights the contextual role of institutional quality, digital infrastructure, human capital, AI governance, ecosystem diversity, and digital inequality in shaping the effectiveness of these relationships.

4. Discussion and Theoretical Implications

4.1 Positioning AI Capability Orchestration Theory

The principal contribution of this study lies in repositioning artificial intelligence (AI) from a firm-level technological asset to a regionally orchestrated strategic capability that enables adaptive economic development. Existing strategic management literature has consistently argued that competitive advantage originates from superior resources and dynamic capabilities that enable organizations to sense opportunities, seize them through strategic action, and continuously transform organizational assets (Barney, 1991; Teece, 2007; Teece et al., 1997). Although these perspectives remain fundamental for explaining organizational adaptation, they largely assume that capability development occurs within individual firms. Such an assumption is increasingly insufficient in AI-intensive environments where technological resources, knowledge, data, and innovation are distributed across multiple organizations and institutional actors.

AI Capability Orchestration Theory extends this perspective by arguing that the strategic value of AI emerges not primarily from technological ownership but from the collective capability to coordinate complementary resources embedded within regional innovation ecosystems. This shift relocates the locus of capability development from individual organizations toward collaborative regional systems in which governments, firms, universities, research organizations, digital infrastructure providers, financial institutions, and intermediary institutions jointly contribute to regional adaptation. Consequently, regional competitiveness increasingly depends on the quality of ecosystem coordination rather than on the technological sophistication of individual organizations.

The proposed theory also advances Resource Orchestration Theory by extending orchestration beyond managerial actions occurring within organizational boundaries. Previous studies conceptualize orchestration as managerial processes involving resource structuring, bundling, and leveraging to improve firm performance (Sirmon *et al.*, 2007, 2011). In contrast, AI Capability Orchestration Theory conceptualizes orchestration as an ecosystem-level capability involving strategic alignment, institutional synchronization, resource integration, and collaborative learning among autonomous actors operating under diverse institutional logics. This broader interpretation reflects the contemporary nature of AI development, where innovation increasingly depends on coordinated governance, data-sharing arrangements, regulatory coherence, and cross-sector partnerships rather than isolated managerial decisions.

The theory likewise complements ecosystem perspectives developed by Adner (2017) and Jacobides *et al.* (2018). While ecosystem research explains how complementary actors jointly create value, it generally emphasizes innovation complementarities and platform interactions rather than adaptive regional transformation. AI Capability Orchestration Theory extends this perspective by introducing orchestration as the mechanism through which ecosystem interactions become enduring regional capabilities that strengthen resilience under technological and institutional uncertainty. In doing so, the theory shifts analytical attention from collaborative value creation toward capability coordination as the foundation of long-term regional adaptation.

The proposed framework further enriches digital transformation research by distinguishing technological modernization from inclusive digital transformation. Existing studies frequently conceptualize digital transformation as organizational redesign enabled by digital technologies (Verhoef *et al.*, 2021; Vial, 2019). However, technological modernization alone does not necessarily enhance regional adaptive capacity because digital benefits often remain concentrated among technologically advanced organizations. The present study argues that digital transformation contributes to regional resilience only when orchestrated AI capabilities facilitate widespread capability diffusion, institutional collaboration, equitable technological access, and ecosystem learning. Consequently, inclusive digital transformation represents a developmental process through which AI becomes embedded across the regional economy rather than remaining confined to individual organizations.

Finally, AI Capability Orchestration Theory advances regional resilience scholarship by explicitly incorporating AI capability as a strategic antecedent of adaptive regional development. Earlier resilience studies emphasize industrial diversity, institutional quality, innovation systems, and evolutionary path development (Boschma, 2015; Martin, 2012; Martin & Sunley, 2015). Although these perspectives remain highly relevant, they provide comparatively limited explanation regarding how AI reshapes regional adaptive capacity. The proposed theory complements existing resilience research by identifying coordinated AI capability deployment as a central mechanism through which technological resources become embedded within regional institutions and innovation ecosystems. Collectively, these theoretical extensions position AI Capability Orchestration Theory as a meso-level framework bridging strategic management, digital transformation, ecosystem research, and regional development through a unified explanatory mechanism.

4.2 Contributions to Strategic Management and Regional Development

This study contributes to strategic management literature by extending Dynamic Capabilities Theory beyond organizational boundaries. Existing research has predominantly examined sensing, seizing, and transforming as firm-level processes that enable competitive advantage (Teece, 2007). The present framework demonstrates that these capability processes increasingly occur across regional innovation ecosystems where multiple organizations collectively generate adaptive capacity. Accordingly, competitive advantage

should be understood not solely as an organizational outcome but also as an emergent property of coordinated regional capability systems.

A second contribution concerns the introduction of AI Capability Orchestration as a distinct theoretical construct. Previous AI literature generally conceptualizes AI capability as an organizational competence consisting of technological infrastructure, data resources, analytical expertise, and managerial capability (Mikalef & Gupta, 2021; Raisch & Krakowski, 2021). This study broadens the construct by conceptualizing AI capability as a distributed regional resource whose developmental value depends on orchestration rather than ownership. This distinction provides a stronger theoretical explanation for why regions possessing comparable technological investments frequently display markedly different innovation performance and resilience outcomes.

Third, the proposed theory contributes to digital transformation scholarship by integrating technological innovation with inclusive regional development. Existing research primarily evaluates digital transformation according to improvements in productivity, efficiency, organizational performance, and business model innovation (Bharadwaj *et al.*, 2013; Vial, 2019). The present framework argues that successful AI-enabled transformation should also be assessed according to its capacity to broaden participation, strengthen institutional collaboration, reduce digital inequality, and expand ecosystem learning. Inclusive digital transformation therefore functions not merely as a technological outcome but as the principal developmental mechanism connecting AI capability with resilient regional economies.

The theory also contributes to regional development literature by offering a capability-based explanation of regional resilience. Previous studies largely explain resilience through structural conditions such as industrial diversity, institutional quality, innovation systems, and historical path dependence (Boschma, 2015; Isaksen & Trippel, 2016). While these perspectives effectively explain cross-regional variation, they provide relatively limited insight into the dynamic processes through which technological capabilities become regionally embedded. AI Capability Orchestration Theory addresses this limitation by identifying ecosystem coordination as the process through which distributed AI capabilities evolve into adaptive regional capacity.

More broadly, the proposed framework demonstrates that strategic management, innovation studies, digital transformation, and regional development should not be treated as isolated theoretical domains. Regional resilience emerges through continuous interaction among technological capability development, institutional coordination, collaborative governance, ecosystem learning, and inclusive innovation. This integrated perspective contributes to cumulative theory development by establishing a common conceptual platform that connects previously fragmented research streams while providing a coherent explanation of AI-enabled regional transformation.

The theoretical contribution can also be understood as a sequential capability-development process illustrating how coordinated ecosystem actions progressively transform dispersed AI resources into sustained regional adaptive capacity.

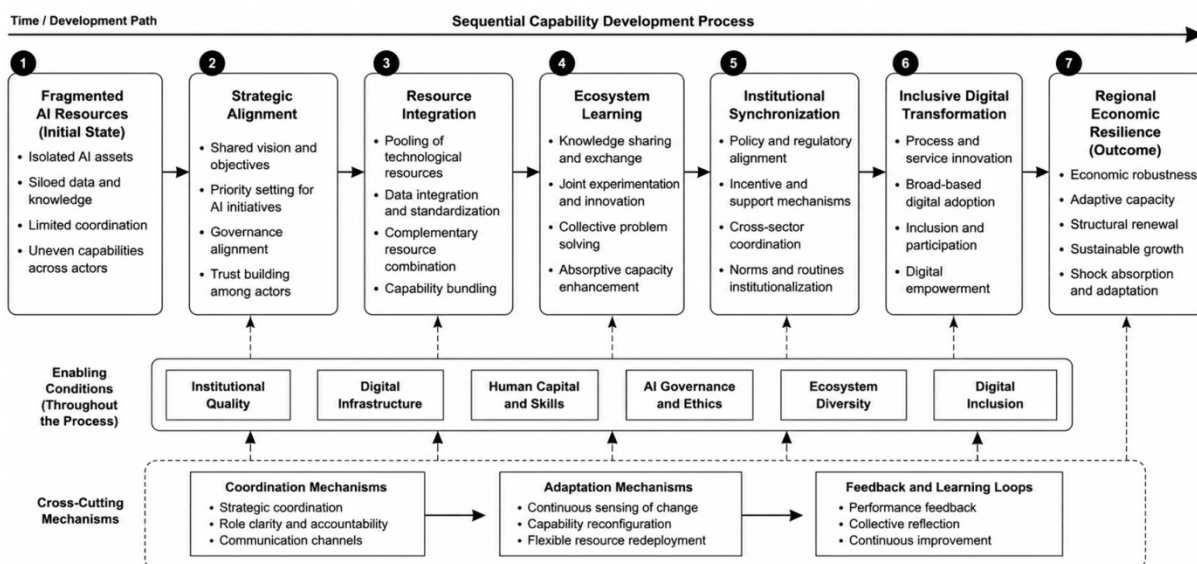


Figure 3. Sequential Capability Development Process in AI Capability Orchestration Theory
Source: Developed by the authors based on Teece et al. (1997); Teece (2007); Sirmon et al. (2011); Adner (2017); Jacobides et al. (2018); Martin (2012); Boschma (2015); Mikalef and Gupta (2021); Raisch and Krakowski (2021); and Dwivedi et al. (2023).

Figure 3 portrays AI Capability Orchestration Theory as a dynamic capability-development process rather than a static causal model. Fragmented AI resources are progressively transformed through strategic alignment, resource integration, ecosystem learning, and institutional synchronization, producing inclusive digital transformation and ultimately regional economic resilience. The sequential representation emphasizes that resilience emerges from cumulative orchestration processes instead of direct technological investment alone, reinforcing the theory's process-oriented contribution.

4.3 Policy and Managerial Implications

The theoretical arguments developed in this study have important implications for policymakers responsible for regional digital transformation. Governments worldwide continue to invest heavily in AI infrastructure, national AI strategies, digital public services, and innovation policies. However, the proposed theory suggests that technological investment alone is unlikely to generate resilient regional economies unless accompanied by effective capability orchestration. Accordingly, policy priorities should shift from maximizing AI adoption toward strengthening institutional coordination among governments, universities, industries, financial institutions, research organizations, and intermediary institutions.

Rather than emphasizing isolated technology projects, regional policy should encourage ecosystem governance that facilitates collaborative capability development. Policies supporting shared digital infrastructure, regional data ecosystems, AI innovation hubs, collaborative research networks, digital skills development, regulatory interoperability, and public-private partnerships are likely to generate greater adaptive capacity than fragmented investment initiatives. Such orchestration mechanisms improve knowledge diffusion, reduce duplication of resources, and strengthen long-term ecosystem resilience.

The theory also highlights the strategic importance of human capital and institutional quality. AI technologies require complementary investments in education, workforce reskilling, digital literacy, lifelong learning, and organizational absorptive capacity. Regions possessing advanced technological infrastructure but insufficient human capability may experience technological concentration without achieving inclusive transformation. Similarly, weak governance may constrain collaboration despite substantial AI investment. Consequently,

effective AI policy requires simultaneous development of technological capability, institutional quality, and collaborative governance.

For managers, the findings imply that AI investment should increasingly be viewed within broader regional ecosystems rather than solely through organizational performance objectives. Firms actively participating in collaborative innovation networks, university partnerships, regional AI platforms, industrial associations, and knowledge-sharing initiatives are likely to generate stronger long-term adaptive capabilities than organizations pursuing isolated digital strategies. Competitive advantage therefore increasingly depends upon ecosystem participation, complementary capability integration, and collaborative learning rather than technological superiority alone. This perspective also suggests that managerial capability should encompass ecosystem engagement, institutional collaboration, and strategic coordination alongside internal AI deployment.

4.4 Future Research Agenda and Theoretical Boundaries

Although AI Capability Orchestration Theory provides a new explanation of AI-enabled regional resilience, its explanatory scope is intentionally bounded. The theory is primarily applicable to regions undergoing significant digital transformation where AI technologies increasingly influence economic activity and where multiple institutional actors actively participate in regional innovation ecosystems. Its explanatory power may be more limited in regions characterized by weak digital infrastructure, fragmented institutions, or minimal technological adoption, where foundational development constraints remain dominant.

The theory further assumes the existence of collaborative governance and sustained interaction among ecosystem participants. Future empirical research should therefore examine how differences in governance quality, regulatory environments, political institutions, cultural contexts, and levels of inter-organizational trust influence orchestration processes. Comparative studies across developed and emerging economies may reveal important contextual contingencies that refine the proposed causal mechanisms and clarify the external validity of the theory.

Several promising opportunities also exist for empirical validation. Future studies may operationalize AI Capability Orchestration as a multidimensional construct consisting of strategic alignment, resource integration, ecosystem learning, and institutional synchronization. Structural equation modeling may evaluate the sequential mediating role of Inclusive Digital Transformation together with the moderating effects of institutional quality, digital infrastructure, human capital, AI governance, and digital inequality. Longitudinal panel studies would further enable researchers to investigate whether orchestration capability strengthens regional resilience through cumulative learning and capability evolution rather than through immediate technological investment.

Future theoretical refinement may also integrate complementary perspectives from Institutional Theory, Network Governance Theory, Entrepreneurial Ecosystem Theory, and Mission-Oriented Innovation. These perspectives may enrich understanding of legitimacy formation, collaborative governance, ecosystem evolution, and the strategic role of governments in coordinating AI capability toward broader societal transformation. Rather than replacing the proposed framework, such integration would expand its explanatory richness while preserving orchestration as the central causal mechanism.

Overall, AI Capability Orchestration Theory should be viewed as a foundational middle-range theory that connects organizational capability development with regional adaptive outcomes through coordinated ecosystem capability. By explicitly specifying its causal mechanisms, theoretical boundaries, and contextual conditions, the framework provides a rigorous foundation for cumulative empirical research while advancing a more integrated understanding of how AI-enabled ecosystems contribute to resilient, adaptive, and inclusive regional economic development.

Future empirical studies are required to validate, refine, and extend the proposed theory across diverse institutional contexts, methodological approaches, and levels of regional digital transformation.

Table 2. Future Research Agenda for AI Capability Orchestration Theory

Research Direction	Key Research Question	Recommended Methodology	Expected Contribution
Construct Development	How can AI Capability Orchestration be conceptualized and operationalized as a multidimensional construct?	Scale development, expert validation, CFA, SEM	Establish reliable and valid measurement instruments
Theory Validation	Do the proposed sequential relationships among constructs hold empirically?	SEM, PLS-SEM, covariance-based SEM	Empirical validation of the proposed middle-range theory
Mediation Mechanism	Does Inclusive Digital Transformation mediate the relationship between AI Capability Orchestration and Regional Economic Resilience?	Mediation analysis, SEM	Verification of the proposed causal mechanism
Boundary Conditions	How do institutional quality, digital infrastructure, human capital, AI governance, ecosystem diversity, and digital inequality influence the model?	Moderation analysis, multi-group SEM	Refinement of contextual boundary conditions
Longitudinal Dynamics	How does orchestration capability evolve over time?	Longitudinal panel analysis	Understanding capability evolution and adaptive learning
Multi-Level Analysis	How do organizational AI capabilities aggregate into regional adaptive capability?	Hierarchical Linear Modeling (HLM), Multilevel SEM	Integration of firm-level and regional-level perspectives
Ecosystem Governance	Which governance mechanisms most effectively support AI Capability Orchestration?	Comparative case studies, Social Network Analysis	Better understanding of ecosystem coordination mechanisms
Cross-National Comparison	Does the proposed theory operate similarly across different institutional environments?	Cross-country comparative studies	Examination of external validity and contextual variation
Theory Extension	How can complementary theories enrich AI Capability Orchestration Theory?	Conceptual synthesis, empirical testing	Extension toward a broader regional digital transformation theory

Source: Developed by the authors.

Table 2 outlines a systematic research agenda for advancing AI Capability Orchestration Theory beyond conceptual development. It identifies priority areas for construct operationalization, empirical validation, multilevel investigation, and cross-context comparison while emphasizing the importance of testing mediating mechanisms and contextual boundary conditions. Collectively, these directions provide a structured pathway for cumulative theory refinement and future empirical research on AI-enabled regional transformation.

5. Conclusion

Artificial intelligence (AI) is increasingly recognized as a transformative force shaping digital transformation and regional development, yet existing scholarship has provided only fragmented explanations of how AI investments translate into resilient regional economic outcomes. While strategic management emphasizes organizational capability development, digital transformation research focuses on technology-enabled organizational change, ecosystem studies explain collaborative value creation, and regional resilience literature highlights institutional adaptation and industrial evolution, these perspectives have largely evolved independently. Consequently, the literature has lacked an integrative meso-level explanation capable of connecting distributed AI capabilities, ecosystem coordination, inclusive digital transformation, and regional economic resilience within a coherent theoretical framework. Addressing this unresolved gap constituted the primary objective of this study, which sought to develop a middle-range theory explaining the mechanism through which AI-enabled capabilities become collective drivers of adaptive regional development.

The central contribution of this paper is the development of AI Capability Orchestration Theory, which reconceptualizes AI capability as a regionally embedded strategic capability whose developmental value emerges through deliberate coordination among heterogeneous ecosystem actors rather than through technology ownership alone. By positioning orchestration as the missing explanatory mechanism, the proposed theory extends prevailing perspectives that primarily emphasize organizational resources, technological adoption, or ecosystem participation in isolation. Instead, it argues that regional resilience is an emergent property of sustained capability coordination involving strategic alignment, resource integration, ecosystem learning, and institutional synchronization. This reconceptualization shifts the analytical emphasis from technological investment toward coordinated capability deployment, thereby offering a more comprehensive explanation for why regions exhibiting similar levels of AI investment frequently experience markedly different developmental trajectories.

The proposed conceptual framework advances existing knowledge in several important ways. First, it extends Dynamic Capabilities Theory beyond organizational boundaries by demonstrating that capability development increasingly occurs across regional innovation ecosystems rather than within individual firms alone. Second, it expands Resource Orchestration Theory by conceptualizing orchestration as an ecosystem-level coordination capability involving governments, industries, universities, financial institutions, research organizations, and intermediary actors operating under diverse institutional arrangements. Third, it enriches digital transformation scholarship by introducing Inclusive Digital Transformation as the principal developmental mechanism linking coordinated AI capability with regional adaptation, thereby moving beyond organizational modernization toward ecosystem-wide capability diffusion and equitable technological participation. Finally, it contributes to regional resilience literature by explicitly integrating AI capability into explanations of adaptive regional development, positioning technological capability not as a contextual condition but as a strategically orchestrated antecedent of long-term resilience.

Beyond its theoretical contributions, the study also offers important practical implications. For policymakers, the findings suggest that regional competitiveness cannot be achieved solely through expanding AI infrastructure or increasing technology adoption. Instead, resilient regional development requires governance arrangements that facilitate ecosystem collaboration, institutional coordination, knowledge exchange, and complementary capability development across public and private actors. Investments in digital infrastructure should therefore be accompanied by policies promoting data interoperability, collaborative innovation, workforce development, responsible AI governance, and inclusive access to digital opportunities. For organizational leaders, the proposed framework highlights that sustainable competitive advantage increasingly depends on active participation within

regional innovation ecosystems rather than isolated organizational AI initiatives. Firms capable of integrating their AI capabilities with universities, governments, research institutions, and collaborative innovation networks are likely to generate stronger adaptive capacity and contribute more effectively to regional resilience.

Although the proposed theory provides a coherent conceptual explanation, several limitations should be acknowledged. As a conceptual study, the framework has not yet been subjected to empirical validation, and the proposed relationships remain theoretically derived. Moreover, the theory is intentionally bounded to regions characterized by substantial digital transformation, collaborative governance, and active innovation ecosystems. Its explanatory power may therefore vary across institutional environments with differing levels of digital infrastructure, governance quality, technological maturity, and socioeconomic development. These limitations should be viewed not as weaknesses of the theory but as clearly defined boundary conditions that guide its appropriate application and future refinement.

The conceptual nature of the study opens multiple opportunities for subsequent research. Future studies should develop valid and reliable measurement scales for AI Capability Orchestration and empirically examine its multidimensional structure across diverse regional contexts. Longitudinal and multilevel investigations could evaluate the sequential relationships proposed in this framework while exploring how orchestration capabilities evolve through cumulative learning and institutional adaptation. Comparative studies across developed and emerging economies would further clarify the contextual contingencies affecting orchestration processes and test the generalizability of the proposed theory. Additional theoretical integration with Institutional Theory, Network Governance Theory, Entrepreneurial Ecosystem Theory, and Mission-Oriented Innovation may also enrich understanding of how governance configurations shape AI-enabled regional transformation under conditions of technological disruption and geopolitical uncertainty.

In conclusion, AI Capability Orchestration Theory provides a novel middle-range explanation of how distributed AI capabilities can be transformed into resilient regional development through coordinated ecosystem capability. By integrating previously disconnected perspectives from strategic management, digital transformation, ecosystem research, and regional resilience into a single explanatory framework, this study establishes a stronger foundation for cumulative theory development and future empirical inquiry. As AI increasingly becomes a defining driver of economic transformation, understanding not merely how AI is adopted but how it is collectively orchestrated will be essential for advancing more resilient, adaptive, and inclusive regional economies. The theory proposed in this study therefore represents both a conceptual advancement and a strategic lens through which future scholarship and policy can better understand the evolving relationship between AI capability, ecosystem coordination, and sustainable regional development.

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