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Resilient innovation ecosystems and sustainable business growth: Exploring the mediating role of organizational agility and the moderating role of digital platform integration

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Abstract

This study aimed to: 1. to assess the direct impact of firm participation in resilient innovation ecosystems on Sustainable Business Growth (SBG); 2. examine the mediating role of Organizational Agility (OA) in translating the benefits of ecosystem participation into long-term growth performance; 3. evaluate the moderating role of Digital Platform Integration (DPI) in strengthening the relationship between RIE and OA; 4. develop and empirically test a moderated mediation model linking RIE, OA, DPI, and SBG in innovation-intensive industries; and 5. provide theoretical and managerial insights for designing ecosystem participation strategies, enhancing agility capabilities, and leveraging digital platforms for competitive advantage and sustainability. The sample consisted of 390 innovation-intensive firms in Northern Thailand. This study employs Structural Equation Modeling (SEM) and Hayes' PROCESS analysis were employed to test a moderated mediation model. The results showed that: 1. RIEs had a significant positive impact on SBG; 2. OA partially mediated the relationship between RIEs and SBG, supporting the Dynamic Capabilities perspective that agility underpins sensing, seizing, and reconfiguration; 3. DPI played a significant moderating role between RIEs and OA and strengthened the indirect effect of RIEs on SBG through OA; 4. the overall model was empirically supported, demonstrating the interactive mechanisms among ecosystem resilience, agility, and digital integration. 5. The study advances the literature by integrating

resilience theory, dynamic capabilities theory, and platform theory into a unified explanatory framework. In practice, this study provides actionable insights for SMEs seeking to achieve long-term sustainability under turbulence and policy recommendations for governments to invest in national digital infrastructure and open innovation platforms.

Keywords: resilient innovation ecosystems, organizational agility, digital platform integration, sustainable business growth

Background and Significance

The outbreak of COVID-19 acted as a global inflection point, drastically reshaping innovation dynamics across industries. Beyond being a health crisis, the pandemic accelerated the digital transformation of businesses, intensifying the need for resilience in Volatile, Uncertain, Complex, and Ambiguous (VUCA) environments. Traditional firm-centric models of innovation, which often relied on closed R&D departments, proved inadequate to meet the rapid pace and unpredictability of change. As a result, firms increasingly turned to innovation ecosystems, which are adaptive networks of suppliers, customers, startups, regulators, and platform providers, as strategic infrastructures for survival and long-term growth.

Innovation ecosystems, defined as interdependent networks of actors who co-create and diffuse innovations through shared resources, capabilities, and knowledge, offer a distinct approach compared to traditional linear value chains. Ecosystems thrive on interdependence, mutual adaptation, and joint value creation, which enables rapid responses to market changes. The pandemic brought attention to these ecosystems, as governments, technology firms, and universities collaborated to develop solutions like contact tracing apps and remote learning systems at unprecedented speed. These examples highlight the potential of ecosystems to absorb shocks and serve as platforms for rapid, distributed innovation.

Innovation views undergo a paradigmatic shift from firm-centric to ecosystem-centric. In the ecosystem model, innovation is not confined to organizational boundaries but extends into collaborative networks facilitated by digital platforms (Chesbrough, 2020). This shift has strategic implications for firms, as innovation capabilities are increasingly relational and networked, not merely internal. For instance, manufacturers in Germany leveraged Industry 4.0 ecosystems to reconfigure supply chains during pandemic disruptions, while Southeast Asian startups collaborated with logistics and fintech firms via APIs to maintain last-mile delivery under lockdowns. These examples show that ecosystems are more than just places where people can work together; they are also important strategic structures for growth and resilience.

The idea of ecosystems has become very popular around the world as a business and policy goal, but there are still big gaps in our understanding of how ecosystem participation leads to long-term business growth. Resilience is increasingly recognized as a key attribute of successful ecosystems, referring

to their ability to absorb shocks, adapt, and reorganize during turbulence (Folke, 2006). However, the pathways by which ecosystem resilience leads to firm-level growth are not well explored. Organizational agility, the ability to sense changes, respond rapidly, and reconfigure resources, is essential for firms to convert ecosystem-level advantages into growth outcomes (Teece et al., 2016). Additionally, Digital Platform Integration (DPI) plays a critical role in enabling interoperability, data transparency, and scalability, allowing firms to leverage ecosystem resources more effectively (Gawer & Cusumano, 2014).

This study is developed to address key research gaps in several areas, particularly regarding the linkage between Resilient Innovation Ecosystems (RIEs) and Sustainable Business Growth (SBG), which still lacks the development of an integrated model demonstrating the impact of ecosystems on growth in multiple dimensions such as finance, innovation, environment, and society. Additionally, Organizational Agility (OA) as a mechanism linking ecosystem participation with long-term growth remains underexplored. Digital Platform Integration (DPI) plays a crucial role in strengthening the RIEs–OA–SBG pathway, but it also lacks sufficient theoretical development and detailed investigation. Lastly, there is a contextual gap in the literature, as much of the research has focused on advanced economies and high-tech industries, while emerging economies, such as SMEs in Northern Thailand, which face challenges from turbulence and resource constraints, remain underrepresented. Despite these challenges, resilience, agility, and digital integration are of critical importance for business development in this context.

Objective

1. This study aims to assess the direct impact of firm participation in Resilient Innovation Ecosystems (RIE) on sustainable business growth (SBG).
2. This study aims to examine the mediating role of Organizational Agility (OA) in translating the benefits of ecosystem participation into long-term growth performance.
3. This study aims to evaluate the moderating role of Digital Platform Integration (DPI) in strengthening the relationship between RIE and OA.
4. This study aims to develop and empirically test a moderated mediation model linking RIE, OA, DPI, and SBG in innovation-intensive industries.
5. This study aims to provide theoretical and managerial insights for designing ecosystem participation strategies, enhancing agility capabilities, and leveraging digital platforms for competitive advantage and sustainability.

Literature Review

Resilient Innovation Ecosystems (RIE)

The concept of the innovation ecosystem builds on biological metaphors, emphasizing interdependence and co-evolution among diverse actors such as firms, universities, governments, and

startups (Adner, 2006; Autio & Thomas, 2014). Early research was shaped by three strands: regional innovation systems (Cooke, 2001), open innovation (Chesbrough, 2003), and the platform economy (Gawer & Cusumano, 2014). These perspectives gradually converged to portray ecosystems as adaptive, networked systems enabling collective innovation (Nambisan et al., 2019).

Adding resilience to the ecosystem perspective emphasizes adaptability, redundancy, and recovery in volatile environments (Folke, 2006). REs possess five defining characteristics: 1) adaptability and flexibility, 2) diversity and redundancy, 3) modularity enabled by digital infrastructures, 4) trust-based governance, and 5) real-time data sharing (Klerkx & Rose, 2020). These features ensure not only continuous innovation but also robustness during crises such as COVID-19.

REs go beyond measuring innovation outputs in patents or products; they emphasize long-term sustainability outcomes, including environmental stewardship and social value creation. However, empirical research remains fragmented, focusing on developed economies and high-tech industries, with limited attention to emerging markets where resilience may be most critical.

Organizational Agility (OA)

OA originates in Dynamic Capabilities Theory (DCT), which defines dynamic capabilities as the firm's ability to sense, seize, and transform resources to sustain competitiveness in turbulent contexts (Teece, 2007; Teece et al., 1997). OA represents the operational manifestation of dynamic capabilities, emphasizing speed, learning, and adaptability (Doz & Kosonen, 2010).

Scholars distinguish OA into several dimensions: sensing agility (identifying changes and opportunities), decision-making agility (rapid, informed choices), execution agility (efficient implementation), resource reconfiguration agility (adjusting resource allocation), and learning agility (absorbing knowledge and iterating practices) (Overby et al., 2006).

Empirical studies show that OA enhances financial, operational, and innovation performance (Chakravarty et al., 2013). In ecosystems, OA enables firms to convert external knowledge and partnerships into sustainable outcomes. However, OA remains underexplored as a mediating mechanism between ecosystems and growth representing a key theoretical gap.

Digital Platform Integration (DPI)

Digital platforms serve as both technological infrastructures and governance mechanisms, orchestrating interactions across ecosystems (Gawer & Cusumano, 2014; Parker et al., 2016). Platforms generate network effects, modularity, and scalability, making them strategic enablers of innovation (Cennamo & Santalo, 2019).

DPI is defined as the degree to which firms embed platform tools into technologies, data, processes, and governance mechanisms (Cenamor et al., 2017). Four key dimensions are identified: technological integration (e.g., APIs, interoperability), data integration (sharing and analytics), process integration (embedding platforms into supply chain, R&D, and marketing), and ecosystem coordination mechanisms (rules, incentives, and governance) (Srai & Lorentz, 2019; Yoo et al., 2010).

High DPI enhances firms' ability to sense opportunities, coordinate responses, and reconfigure resources, thus reinforcing agility. However, excessive platform dependency can also create risks of lock-in, governance imbalance, and cybersecurity concerns (Cusumano et al., 2019). Despite its importance, DPI remains under-theorized as a moderating variable that conditions the effectiveness of ecosystem participation.

Sustainable Business Growth (SBG)

Traditionally measured through financial indicators, growth is now recognized as a multidimensional construct encompassing financial, environmental, and social performance (Elkington, 1998). Within ecosystems, SBG arises not only from resource accumulation but from collaboration, dynamic capabilities, and resilience (Adner, 2017).

Three ecosystem mechanisms drive SBG: 1) collaboration and knowledge sharing, which shorten innovation cycles and expand opportunities (Powell et al., 1996) 2) dynamic capabilities development, enabling firms to sense and seize ecosystem opportunities (Teece, 2018); and 3) risk sharing and resilience, which sustain operations during shocks (Brusset & Teller, 2017).

Moreover, Environmental, Social, Governance (ESG) frameworks have expanded the definition of sustainable growth. Firms integrating ESG into ecosystems drive green innovations, inclusive social value creation, and trust-based governance, which enhance long-term competitiveness (Friede et al., 2015; George et al., 2016). Thus, SBG extends beyond profitability to align with societal and environmental imperatives.

This study emphasizes the interconnections between Resilient Innovation Ecosystems (RIEs), Organizational Agility (OA), Digital Platform Integration (DPI), and Sustainable Business Growth (SBG). RIEs promote SBG by enhancing collaboration, dynamic capabilities, and resilience. OA acts as a mediator, enabling organizations to leverage ecosystem advantages for growth, while DPI moderates the relationship between RIEs and OA, strengthening the indirect pathway to SBG. The research highlights the critical role of ecosystems, agility, and digital platforms in driving sustainable growth.

Research Conceptual Framework

Based on the researcher's study of theoretical concepts and review of related research literature, a conceptual framework for the research has been established, as shown in Figure. 1.

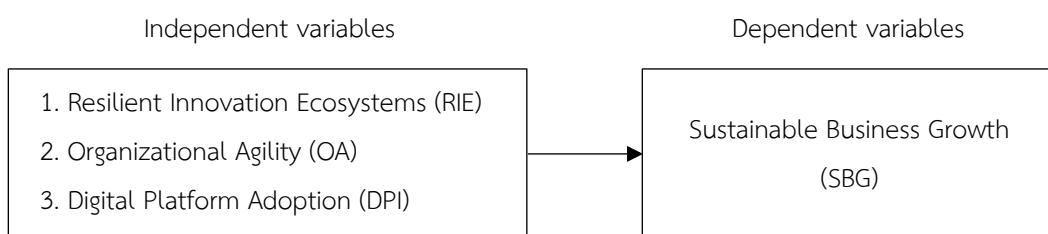


Figure. 1 Research conceptual framework

Methods

This study is exploratory research. The researcher has outlined the following research steps:

1. Population and sample

This study focuses on organizations as the unit of analysis, specifically targeting firms involved in innovation, digital platform adoption, and sustainable business growth. The target sample size for this study is 390 firms, which is justified both theoretically and statistically through purposive sampling. Structural Equation Modeling (SEM) requires a large sample size to ensure the stability of parameter estimation and statistical power. A minimum sample size of 200 is recommended for moderately complex models, and the selected sample of 390 firms ensures reliable results and strengthens the credibility of the research conclusions.

2. Research tools

The primary research tool for this study is a questionnaire designed to collect data from senior executives (e.g., CEO, CIO, CMO) and innovation managers within the firms. These executives and managers are key informants with the strategic knowledge necessary to assess ecosystem engagement, organizational agility, and growth outcomes. The questionnaire includes items designed to measure Innovation Readiness (RIE), Organizational Agility (OA), Digital Platform Adoption (DPI), and Sustainable Business Growth (SBG). The researcher will conduct content validity testing by having three experts review the questionnaire items to ensure they cover the variables to be measured, with a content validity index of 0.95. Reliability testing will be performed by calculating Cronbach's Alpha to assess the internal consistency of the items for each variable, with a result of 0.85, indicating that the instrument is reliable.

3. Data collection

Data collection will involve surveys administered to senior executives and innovation managers across the target firms. These individuals are chosen due to their strategic responsibilities and ability to provide reliable insights into the firm's engagement with ecosystems, organizational agility, and sustainable growth. The survey will focus on gathering quantitative data on the four main constructs of the study.

4. Data analysis

Data analysis will utilize Structural Equation Modeling (SEM) to test the relationships between the constructs. SEM is appropriate for this study as it allows for the analysis of complex relationships involving multiple latent variables and pathways. The research will also apply Hayes' PROCESS analysis to test the moderated mediation model, examining how Organizational Agility (OA) mediates the relationship between Resilient Innovation Ecosystems (RIEs) and Sustainable Business Growth (SBG), while Digital Platform Integration (DPI) moderates the RIE-OA link. The analysis will ensure statistical power and parameter stability, providing a comprehensive understanding of the research model.

Results

1. To assess the direct impact of firm participation in resilient innovation ecosystems on sustainable business growth (SBG). The regression analysis confirmed that Resilient Innovation Ecosystems (RIEs) significantly and positively impact Sustainable Business Growth (SBG). The model showed that RIE explains 32.7% of the variation in SBG ($R^2 = 0.327$), with a strong positive correlation ($R = 0.572$). The direct effect of RIE on SBG was significant, with a regression coefficient of $B = 0.661$, indicating that higher participation in resilient ecosystems drives business growth across financial, operational, and innovation dimensions.

2. To examine the mediating role of organizational agility (OA) in translating the benefits of ecosystem participation into long-term growth performance. Mediation analysis revealed that Organizational Agility (OA) plays a pivotal role in translating the benefits of ecosystem participation (RIE) into sustainable business growth. The indirect effect of RIE on SBG via OA was significant ($\beta = 1.2288$, 95% CI = [0.9677, 1.4850]), confirming that organizational agility enhances the impact of ecosystem participation on growth. This validates that OA mediates the relationship between RIE and SBG.

3. To evaluate the moderating role of digital platform integration (DPI) in strengthening the relationship between RIE and OA. Moderation analysis demonstrated that Digital Platform Integration (DPI) significantly strengthens the relationship between RIE and OA. The interaction effect between RIE and DPI was significant ($\beta = 0.215$, $p = 0.003$, 95% CI = [0.073, 0.357]), indicating that firms with higher DPI are better positioned to leverage the benefits of ecosystem participation, thereby enhancing organizational agility. This supports the hypothesis that DPI amplifies the positive effect of RIE on OA.

4. To develop and empirically test a moderated mediation model linking RIE, OA, DPI, and SBG in innovation-intensive industries. The study successfully developed and tested a moderated mediation model, which confirms that RIEs enhance SBG both directly and indirectly through OA. DPI was found to moderate the relationship between RIE and OA, strengthening the indirect pathway to SBG. The conditional process analysis further supported this model, showing that the indirect effect of RIE on SBG through OA is amplified when DPI is high ($\beta = 1.125$, 95% CI = [0.882, 1.381]).

5. To provide theoretical and managerial insights for designing ecosystem participation strategies, enhancing agility capabilities, and leveraging digital platforms for competitive advantage and sustainability. This study provides valuable theoretical insights by integrating Resilient Innovation Ecosystem theory, Dynamic Capabilities theory, and platform theory into a unified model. From a managerial perspective, the findings emphasize the importance of building organizational agility and integrating digital platforms to maximize the benefits of ecosystem participation. Firms can enhance their competitive advantage and sustainability by actively engaging in resilient ecosystems and adopting digital platforms to strengthen their agility and innovation capabilities.

Table 1 Moderate analysis

Model	Effect	SE	t-value	p-value	LLCI	ULCI
RIE→OA	0.62	0.055	11.27	0.000	0.512	0.728
DPI→OA	0.41	0.063	6.51	0.000	0.287	0.533
RIE×DPI→OA	0.215	0.072	2.99	0.003	0.073	0.357
OA→SBG	0.985	0.11	8.95	0.000	0.768	1.202
RIE→SBG	0.272	0.121	2.25	0.025	0.034	0.510
(RIE→OA→SBG)	1.125	0.134			0.882	1.381

Discussion

1. To assess the direct impact of firm participation in resilient innovation ecosystems on Sustainable Business Growth (SBG). The study confirmed that Resilient Innovation Ecosystems (RIEs) significantly and positively impact Sustainable Business Growth (SBG), supporting Hypothesis 1. This aligns with resilience theory, which suggests that ecosystems capable of absorbing shocks and reorganizing maintain functionality and long-term performance (Folke, 2006). The findings also resonate with ecosystem research, showing that firms embedded in resilient ecosystems, such as agricultural cooperatives and tourism clusters, are better equipped to sustain growth even amid disruptions like pandemics. The results support the assertion that ecosystems not only drive innovation but also act as buffers against external challenges, enhancing competitiveness.

2. To examine the mediating role of Organizational Agility (OA) in translating the benefits of ecosystem participation into long-term growth performance. Mediation analysis confirmed that Organizational Agility (OA) partially mediates the relationship between RIEs and SBG, supporting Hypothesis 2. This validates the Dynamic Capabilities Theory (Teece, 2007), emphasizing agility as the operational mechanism that transforms ecosystem resources into sustainable outcomes. The study showed that firms with higher agility, demonstrated through rapid sensing, decision-making, and resource reconfiguration, achieved greater multidimensional growth, including financial performance and ESG contributions. These findings are consistent with prior research on agility as a key driver of organizational performance.

3. To evaluate the moderating role of digital platform integration (DPI) in strengthening the relationship between RIE and OA. Moderation analysis supported Hypothesis 3, confirming that Digital Platform Integration (DPI) strengthens the relationship between RIE and OA. Firms with higher DPI such as those using platforms like Shopee, Lazada, and LINE demonstrated stronger organizational agility due to enhanced visibility, streamlined logistics, and real-time resource reconfiguration (Gawer & Cusumano, 2014). This finding aligns with platform theory (Parker et al., 2016), suggesting that DPI serves as a critical enabler, allowing firms to leverage ecosystem resilience more effectively. The results also underscore the importance of digital platforms in amplifying the impact of resilient ecosystems on firm performance.

4. To develop and empirically test a moderated mediation model linking RIE, OA, DPI, and SBG in innovation-intensive industries. The study successfully developed and tested a moderated mediation model, confirming that RIEs directly and indirectly enhance SBG through OA, with DPI moderating the RIE–OA relationship. This model integrates insights from resilience theory, dynamic capabilities theory, and platform theory, offering a comprehensive framework for understanding how ecosystems, agility, and digital platforms jointly enable sustainable growth. The research contributes to multi-level theorizing, demonstrating that ecosystem engagement, agility, and digital integration together drive growth, particularly in turbulent environments like Northern Thailand.

5. To provide theoretical and managerial insights for designing ecosystem participation strategies, enhancing agility capabilities, and leveraging digital platforms for competitive advantage and sustainability. The study offers several actionable insights for both managers and policymakers. Firms are encouraged to invest in agility development through training and cross-functional teams, prioritize digital platform integration to enhance visibility and resource management, and actively engage in ecosystems to access diverse resources and reduce market dependence. Adner (2017) and Jacobides et al. (2018) stress the value of ecosystem participation, showing that firms embedded in resilient and collaborative ecosystems are more likely to thrive by accessing resources and knowledge that reduce dependence on single markets.

Body of knowledge

This study creates new integrated knowledge linking Resilient Innovation Ecosystems (RIEs) and Sustainable Business Growth (SBG), exploring the mediating role of Organizational Agility (OA) and the moderating role of Digital Platform Integration (DPI), thereby extending the depth of knowledge in the field. The findings confirm that RIEs not only support innovation but also act as buffers that help reduce risks during crises, such as the COVID-19 pandemic. Ecosystem collaboration enables companies to access resources and knowledge networks that support sustainable growth. The research also shows that Organizational Agility (OA) serves as a mechanism through which resilient innovation ecosystems are translated into sustainable outcomes, with firms possessing higher agility benefiting more from resilient innovation ecosystems, aligning with Dynamic Capabilities Theory. Furthermore, Digital Platform Integration (DPI) plays a key role in enhancing agility by enabling firms to adapt quickly, access data, and reconfigure resources in real time, critical for improving organizational performance and market expansion. The study also develops and tests a moderated mediation model, showing that RIEs impact SBG both directly and indirectly through OA and DPI. This framework strengthens the understanding of how ecosystem engagement, agility, and digital integration drive business growth. Finally, the research provides actionable recommendations for managers and policymakers to enhance agility through training and cross-functional teams, integrate digital platforms to improve resource management, and engage in ecosystems to access diverse resources and reduce market dependence. These new insights expand the understanding of the roles of innovation

ecosystems, organizational agility, and digital platform integration in driving sustainable growth, integrating theories such as resilience theory, dynamic capabilities theory, and platform theory.

Suggestions

The findings from this study led the researcher to propose the following suggestions for future research:

1. Suggestions for applying research results

1.1 The findings from this study should be used to develop strategies for driving sustainable business growth, particularly for Small and Medium-sized Enterprises (SMEs), to enhance their competitive capacity in challenging markets.

1.2 Organizations should invest in developing organizational agility through training and creating cross-functional teams to improve responsiveness to market changes and volatile environments.

1.3 The integration of digital platforms into business processes should be considered to improve resource management efficiency and adaptability.

1.4 Importance should be placed on engaging in resilient innovation ecosystems to access diverse resources, which helps reduce reliance on a single market and strengthens competitive advantage.

1.5 Organizations should develop and implement strategies that promote long-term sustainability by integrating elements such as ecosystem participation, agility development, and digital integration.

2. Suggestions for future research

2.1 Future research should expand the study to include different regions and contexts to compare the differences in ecosystem participation and its impact on business growth in challenging markets.

2.2 Longitudinal studies should be conducted to examine the long-term effects of ecosystem participation and digital platform integration, including tracking changes over time.

2.3 Further research should explore the role of ESG frameworks in driving business success across different contexts, to comprehensively assess the impact of ESG integration.

2.4 Comparative research between developed and emerging markets will help broaden understanding and allow for the adaptation of strategies to fit specific contexts

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