

INSTITUTIONAL DYNAMICS AND DIGITAL TRANSFORMATION: A MULTI-LEVEL CONCEPTUAL FRAMEWORK FOR INNOVATION-DRIVEN STARTUP ECOSYSTEMS IN VIETNAM

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ABSTRACT

This paper develops a multi-level conceptual framework to explain how the dynamic interaction of formal and informal institutions shapes innovation-driven startup ecosystems in emerging markets, with particular application to Vietnam's rapidly evolving entrepreneurial landscape. By synthesizing policy, regulatory, and sandbox mechanisms with digital social trust, social capital, and entrepreneurial culture, the model moves beyond static formal–informal dichotomies to capture the causal complexity of contemporary entrepreneurial environments. The framework explicitly incorporates mediating variables (digital transformation, perception, and networking) and moderating factors (sector, region, and degree of internationalization). Thereby, specifying the conditions under which institutional configurations produce differential startup outcomes across lifecycle stages. Three interrelated research questions guide the inquiry, addressing direct institutional effects, mediating transmission mechanisms, and moderating boundary conditions, respectively. A set of nine testable hypotheses is generated, and the framework's explanatory reach is validated through three scenario-based thought experiments drawn from Vietnam's documented regional and sectoral heterogeneity. The study contributes an integrative theoretical architecture suitable for empirical testing via multilevel structural equation modeling or comparative case analysis and offers stage-differentiated policy implications for policymakers and ecosystem actors in digital-transition economies.

Keywords: Entrepreneurial ecosystem, institutional framework, digital transformation, social capital, emerging markets.

1. INTRODUCTION

Entrepreneurship is increasingly establishing itself as a central pillar in economic development strategies and a key driver for innovation in many countries [1-4], especially in emerging economies as Vietnam. Alongside various support policies, the startup ecosystem is facing numerous institutional barriers, including formal institutions (legal, financial, educational, and administrative hurdles) and informal institutions (societal trust, the quality of social networks, corruption control, and entrepreneurial cultural attitudes). However, most institutional approaches still focus on listing relevant factors rather than providing an integrated analysis of causal mechanisms within the institutional–entrepreneurship system.

Current research prioritizes individual-level traits, entrepreneurial decision-making processes, and firm-specific success factors, or employs static and simplified models to assess the impact of institutions on entrepreneurship. Few studies have examined the complex

interactions between different institutional dimensions, paid adequate attention to informal factors such as social trust and social capital, or analyzed the influence of digital transformation, globalization, and exogenous shocks (such as the Covid-19 pandemic) in shaping entrepreneurial dynamics in emerging economies [5-8].

Considered as a typical emerging market, the current Vietnamese context presents new challenges: rapidly policy structure evolving, the unprecedented pace of digital environment, and remaining short-term or pilot in nature of most startup support programs. These realities demand a more refined theoretical research framework that not only describes the impact of individual institutional factors but also clarifies their multidimensional and logical interrelationships, as well as the mediating and moderating mechanisms that channel entrepreneurial outcomes in dynamic and uncertain environments.

Accordingly, it is crucial to develop a new theoretical model to fill the following gaps: (i) Integrate both formal and informal institutional dimensions in a dynamic approach, emphasizing processes and transformation rather than static attributes; (ii) Propose and clarify the roles of mediating and moderating mechanisms (e.g., social trust, social networks, digital transformation, innovative entrepreneurial culture) in the path from institutions to entrepreneurial outcomes; and (iii) Suggest new hypotheses and practical frameworks for future empirical research, helping to build more effective and sustainable startup support policies. The development of such a theoretical model is not only a significant academic contribution but also highly relevant for policymaking, particularly in the midst of increasing uncertainties and rapid transformations characterizing the modern digital economy. Building on these gaps, the present study addresses three interrelated research questions:

RQ1: What are the key formal and informal institutional dimensions shaping innovation-driven startup ecosystems in Vietnam, and how does their dynamic interaction influence entrepreneurial intent and startup performance across lifecycle stages?

RQ2: Through which mediating mechanisms, specifically digital transformation capacity, digital network connectivity, and entrepreneurial perception, do institutional configurations translate into measurable entrepreneurial outcomes in Vietnam's emerging market context?

RQ3: Under what moderating conditions, defined by industry/sector type, geographic region, and degree of ecosystem internationalization, do the effects of formal and informal institutions on startup performance vary most significantly?

These research questions are addressed through a multi-level conceptual synthesis (Section 3), the development of an integrated institutional framework (Sections 5–6), and a set of nine testable hypotheses (Section 7) that operationalize the direct, mediated, and moderated relationships specified above. Together, RQ1 anchors Hypotheses H1–H3 (direct institutional effects), RQ2 underpins Hypotheses H4–H6 (mediating pathways), and RQ3 motivates Hypotheses H7–H9 (moderating boundary conditions).

2. LITERATURE REVIEW

Theoretical and empirical research on entrepreneurial ecosystems and the institutional determinants of entrepreneurship has undergone significant advances and reorientations. Both international and Vietnamese research have converged on the “entrepreneurial ecosystem” (EE) approach, which frames institutional factors, resources, network connectivity, cultural supports, digital capacity, and governance proficiency as the foundational pillars [9-11] for the development and sustainability of innovative entrepreneurial activity [12-15].

According to the OECD Framework [16], a comprehensive assessment of both macro and micro impacts of institutional policy is only effective when an integrated model is utilized,

that simultaneously incorporates financial, policy, educational, network, digital, and community outcomes, and requires a multi-level, dynamic system of indicators and assessment logic, as opposed to traditional static indices. The GEM Global Report 2024/2025 highlights that, in the post-pandemic environment, key factors influencing entrepreneurial intent include risk adaptation capacity, readiness and proficiency in digital transformation, the ability to mobilize non-traditional resources, and the extent of supportive, open, and adaptive policy at national and regional levels [17]. In addition, recent research on “institutional enablers” further clarifies the configuration of factors promoting inclusive entrepreneurship: open markets, legal and regulatory transparency, academy–business ecosystems, levels of connectivity among innovation centers, and the development of social capital [13]. Therefore, beyond formal institutions, new studies emphasize the interplay between cultures of knowledge sharing, degrees of integration into digital/social/financial networks, societal trust, and the presence of flexible regulatory mechanisms in innovative entrepreneurship.

Illustrating for a specific emerging market, Vietnam has been recognized as one of the most dynamic entrepreneurial ecosystems in Southeast Asia, with nearly 4,000 startups (as of 2024), the emergence of unicorns, and legal innovation and international cooperation policies that have raised standards for the investment environment and global competitiveness [12, 14, 13]. Recent studies reveal that Vietnam’s ecosystem remains constrained by traditional institutional barriers, including complex legal procedures, uneven policy enforcement across regions, low societal trust, and a highly fragmented landscape of digital transformation support [14, 18]. Other perspectives, prominent characteristics of founders backed by venture capital in Vietnam include strong international network integration, a continuous learning culture, and higher-than-average risk acceptance behaviors [19].

Most existing frameworks still only segment institutional factors into two levels: formal (policy, finance, law) and informal (networks, culture, trust). Transitional or dynamic factors, such as digital transformation, international connectivity, and digital social capital, are not yet adequately integrated into the theoretical models, and there is a lack of dynamic empirical testing on cross-layer institutional interaction [13, 18, 20]. Some recent Vietnamese studies have called for integrated models, combining traditional institutions with the mediating/driving forces of digital transformation, social capital, flexibility, and the adaptive capacities of startups facing post-Covid-19 volatility. However, empirical approaches remain limited, with most works stopping at descriptive analysis or theoretical hypotheses [18, 20].

These findings provide a robust foundation for proposing an integrative, multi-level conceptual model, with additional attention to mediating and moderating mechanisms that accurately reflect the realities and evolutionary trends of Vietnam’s startup ecosystem and contemporary global entrepreneurship.

3. METHODOLOGY

This paper adopts a conceptual synthesis methodology, drawing on systematic literature review, theoretical triangulation, and thought experiment reasoning to construct an integrated multi-level framework for innovation-driven startup ecosystems. Following the protocols established by [21] for systematic reviews in management research, the study conducts a structured search and critical appraisal of peer-reviewed articles, multilateral institutional reports, and policy documents published between 2018 and 2025, sourced from Scopus, Web of Science, and Google Scholar using keywords including entrepreneurial ecosystem, institutional theory, digital transformation, startup policy, social capital, and emerging markets. Conceptual synthesis, as distinct from meta-analysis or empirical modeling, is appropriate when the objective is to identify theoretical gaps, integrate fragmented constructs into a coherent causal architecture, and generate testable propositions for future empirical inquiry [22-23]. The

framework's internal validity is assessed through theoretical triangulation [24], cross-referencing insights from institutional economics [25], entrepreneurial ecosystem theory [3], and social capital theory [26-27] to ensure conceptual consistency across analytical levels. Finally, thought experiment scenarios, which is a methodological device employed in conceptual economics to stress-test causal propositions under varying boundary conditions [28], are used to illustrate the framework's applicability across distinct institutional and regional contexts within Vietnam's startup landscape.

4. GAPS AND LIMITATIONS IN CURRENT INSTITUTIONAL MODELS

Most prevailing frameworks remain locked into rigid dichotomies between formal institutions (law, finance, administrative procedures) and informal institutions (social trust, culture, networks) [29]. Their explanatory power is consequently limited and one-dimensional, overlooking the transformational roles and contextual multi-level interactions that characterize contemporary entrepreneurial environments. For instance, how digital adaptation or globalization dynamically shifts entrepreneurial incentives across regions and lifecycle stages [14]. Compounding this structural rigidity, current theoretical models pay insufficient attention to mediating and moderating variables such as digital social networks, regionally distinct entrepreneurial cultures, environmental adaptation behaviors, and the differentiated impact of social capital structures within volatility-prone ecosystems [13, 17, 20]. In Vietnam's rapidly evolving context, this static orientation is particularly constraining: sandbox policy reforms, digital infrastructure expansion, and post-COVID ecosystem restructuring have all altered the institutional landscape in ways that cross-sectional, dichotomous models cannot adequately capture [18].

Beyond these structural limitations, existing models fail to reflect the sectoral and network realities of modern digital entrepreneurship. In fact, most frameworks still mainly rely on traditional logic, focusing on procedures, capital, and education, without systematically incorporating mechanisms of digital platforms, digital innovation, newly emerging soft law barriers, or the AI environment [1, 6, 8, 20]. This gap is particularly evident in Vietnam, where AI and fintech startup markets are growing rapidly but experimental regulatory sandboxes and adaptive frameworks remain underdeveloped [20]. Simultaneously, recent research has warned of connectivity gaps across layers of the innovation ecosystem, where small startups, venture investors, universities, and incubators underperform in both horizontal (cross-sectoral) and vertical (cross-layer social capital) interaction [13, 14]. These dynamics are crucial for system-level upgrading, however neither international nor Vietnamese frameworks adequately theorize them.

A third cluster of gaps concerns measurement, underserved startup segments, and exogenous boundary conditions. Reports from the World Bank [30], UNDP, and Startup Genome [31] emphasize systematic inadequacies in measuring policy outcomes for startup development. Existing indicators remain poorly suited to actual practices, and policy designs frequently fail to address key bottlenecks in training, capital, legal protection, and intellectual property. Traditional theoretical models similarly neglect the distinctive features and challenges of green, circular, and impact-driven startups, despite these representing prominent and growing trends in Europe, the United States, and increasingly in Vietnam [30, 17]. Finally, and most critically for the present study, existing frameworks treat the institutional environment as a closed domestic system. They fail to account for exogenous macroeconomic and geopolitical forces such as global inflationary cycles, supply chain disruptions, and US-China technology decoupling that materially condition the effectiveness of domestic institutional arrangements for internationally oriented startups. This assumption of institutional insularity is increasingly untenable in the post-pandemic global economy. Exogenous shocks such as sustained inflationary cycles, global supply chain reconfiguration,

energy price volatility, and geopolitical realignments have materially altered the operating conditions for internationally oriented startups in emerging markets [7-8].

In summary, the primary gaps include: (i) lack of dynamic integration and multi-level interaction; (ii) unclear mediating and moderating roles; (iii) insufficient modeling of digital transition and the unique characteristics of evolving ecosystems; (iv) underdeveloped theorization of social capital and network impacts for new industries; (v) weak practical measurement and policy implementation frameworks; (vi) overall neglect of social- and eco-impact startups; and (vii) insufficient theorization of exogenous macroeconomic and geopolitical forces as boundary conditions on institutional effectiveness in internationally-oriented startup ecosystems. These gaps provide a clear theoretical basis and urgent call to formulate a genuinely integrative, contextually relevant institutional model for Vietnam's modern entrepreneurial ecosystem.

5. A MULTI-LEVEL CONCEPTUAL FRAMEWORK FOR VIETNAM'S INNOVATION-DRIVEN STARTUP ECOSYSTEM

5.1. Rationale and Architectural Logic

The seven gaps identified in Section 4 converge on a shared diagnostic: existing institutional frameworks for entrepreneurial ecosystems are static, segmented, and domestically bounded in ways that render them inadequate for explaining startup outcomes in Vietnam's rapidly evolving digital economy. Addressing these gaps requires not merely adding variables to existing models, but reconceiving the fundamental architecture of institutional analysis. Specifically, the framework proposed here responds to four design imperatives derived from the gap analysis: (i) formal and informal institutions must be integrated within a single causal structure, not treated as parallel inventories; (ii) the mechanisms through which institutions produce outcomes, mediating and moderating variables, must be explicitly specified rather than implied; (iii) digital transformation must be positioned as a transmission channel rather than a background condition; and (iv) the framework must accommodate lifecycle variation, sector heterogeneity, and exogenous macroeconomic boundary conditions that domestic-only models cannot capture.

The architectural choice to separate 'what institutions exist' (components) from 'how they operate' (dynamics, treated in Section 6) responds to a systematic gap in the entrepreneurial ecosystem literature, where static typologies of institutional factors have dominated at the expense of mechanism-level explanation [20, 32].

Table 1 compares the proposed framework against four influential prior models across nine analytical dimensions, illustrating the specific theoretical advances the present study makes relative to the existing literature.

Table 1. Framework Comparison

Dimension	[4] Ecosystem Domains	[3] EE Framework	[14] Vietnam EE Review	[20] Digital EE	Proposed Framework (This Study)
Scope	National ecosystem domains	Relational ecosystem attributes	Vietnam context, static review	Digital ecosystem focus	Multi-level, dynamic, Vietnam-specific
Formal Institutions	Policy, finance, markets	Government, finance	Legal, policy barriers	Partial (digital regulation only)	Full (legal, sandbox, VC, IP, admin)
Informal Institutions	Culture, networks, human capital	Social capital, networks	Partial (culture mentioned)	Partial	Full (digital social capital, trust, mentorship, reputation)
Mediating Mechanisms	Not specified	Not specified	Not specified	DT mentioned but not formalized	Explicit (DT, networking, perception, resilience)
Moderating Conditions	Not specified	Not specified	Not specified	Not specified	Explicit (sector, region, internationalization, DT maturity, global macro)
Lifecycle Dynamics	Static	Partial	Static	Static	Four-stage lifecycle logic
Testable Hypotheses	not addressed	not addressed	not addressed	not addressed	hypotheses (direct, mediated, moderated)
Global Macro/ Geopolitical	not addressed	not addressed	not addressed	not addressed	Moderator (v), exogenous boundary condition
Green/Social -impact Startups	not addressed	not addressed	not addressed	not addressed	Explicit (H7, H9, Scenario C)
Empirical Method Suggested	Qualitative	Case study	Literature review	SLR	ML-SEM, mixed methods, case study

5.2. Component Structure of the Framework

The framework organizes institutional influences on entrepreneurial activity into three interrelated components.

Component 1. Formal Institutions encompass the quality and completeness of legal and regulatory frameworks, the effectiveness of innovation-oriented regulatory sandboxes

(particularly for fintech, AI, blockchain, and the circular economy), capital support policies and venture financing infrastructure, intellectual property protection mechanisms, tax incentives for startup activity, and administrative transparency in investment approval processes [31, 33-34]. In Vietnam's context, formal institutions also include the legal architecture governing digital assets and the nascent experimental sandbox frameworks introduced under recent policy initiatives [35-36].

Component 2. Informal Institutions encompass digitized social capital and community trust in entrepreneurship, the diffusion of an innovative and risk-tolerant entrepreneurial culture, mentorship and tech-startup connection networks, the growth mindset among Vietnam's youth cohort, domestic and international network connectivity, and the reputational ecosystem surrounding entrepreneurial success and failure [19, 34, 37]. Informal institutions operate through behavioral norms and social structures that formal policy instruments cannot easily replicate. Their interaction with formal institutions is non-additive, including synergies and tensions between the two components fundamentally determine ecosystem outcomes [17].

Component 3. Mediating and Moderating variables constitute the transmission and contextual adjustment layer:

Mediators include: (i) enterprise-level digital transformation capacity; (ii) digital networking and mentorship connectivity; (iii) post-crisis adaptation capability; and (iv) entrepreneurial perception variables [31, 37].

Moderators include: (i) industry/sector context (green technology, AI, circular economy, digital logistics); (ii) geographic and regional economic conditions; (iii) degree of ecosystem internationalization; and (iv) leadership roles of policy actors and community champions [17, 34, 36]; (v) Global macroeconomic and geopolitical context: The aggregate external environment constitutes an exogenous boundary condition that shapes the effective range of domestic institutional arrangements. This includes global inflation cycles, supply chain stability, bilateral trade and technology relations (particularly US-China technology decoupling), foreign venture capital availability, and cross-border regulatory convergence in digital assets and AI governance. This moderator is particularly salient for startups in technology-intensive sectors (fintech, AI, advanced manufacturing) that depend on international capital flows, imported components, or cross-border market access. Unlike the sector, regional, and internationalization moderators that are at least partially endogenous to national policy, the global macroeconomic and geopolitical moderator is externally determined and therefore represents a hard constraint on the efficacy of domestic institutional reform [7, 17, 31].

The Dual Conceptual Role of Digital Transformation

A clarification is warranted regarding the theoretical positioning of digital transformation (DT) within this framework, as its role differs across levels of analysis and requires careful distinction from the formal regulatory institutions described in Component 1.

At the firm level, DT functions as a mediating variable through which macro-level institutional inputs such as sandbox policies, digital infrastructure investment, and network connectivity programs are converted into tangible entrepreneurial outcomes at the level of the individual startup. A regulatory sandbox that permits fintech experimentation, for instance, produces performance effects only insofar as the startup has the digital readiness capacity to exploit that regulatory opening. This is the primary, structural role of DT in the framework, operationalized in H4 ('digital transformation mediates the effect of institutional interventions on entrepreneurial outcomes') and H5 ('digital/social capital and network connectivity mediate the link between supportive policies and firm-level performance').

At the ecosystem level, under conditions of sufficiently high aggregate digital maturity, DT may additionally function as a moderating variable, conditioning the relationship between entrepreneurial culture and startup performance. This threshold condition arises when a critical mass of startups, investors, and institutional actors share digital platforms, norms, and capabilities. Specifically, H9 posits that the effect of innovative entrepreneurial culture is amplified among startups actively engaged in digital transformation initiatives and sandbox participation. This moderating role is contingent and secondary: it emerges only when ecosystem-level digital adoption reaches a threshold that enables DT to reshape the institutional context itself, rather than simply transmitting existing institutional effects.

This distinction between DT-as-mediator (firm level, structural, always operative) and DT-as-moderator (ecosystem level, contingent, threshold-dependent) prevents conceptual conflation with the formal regulatory institutions in Component 1. Constructs such as sandbox legal frameworks and digital asset regulations are antecedent institutional inputs, not transmission mechanisms, and should not be treated as equivalent to DT's mediating role.

To facilitate empirical operationalization of the proposed framework, Table 2 presents a preliminary set of measurable indicators and proxy variables for each key latent construct. These indicators are drawn from validated instruments and secondary data sources previously employed in the entrepreneurial ecosystem and institutional economics literatures, and are proposed as starting points for scale development and confirmatory testing in future empirical studies.

Table 2. Operationalization of Latent Variables

#	Latent Construct	Theoretical Dimension	Proposed Observable Indicators / Proxies	Measurement Type	Data Source
Formal institutions					
1.1	Legal & Regulatory Quality	Completeness and enforceability of startup-related law	Regulatory Quality Index score; World Bank Ease of Doing Business sub-index (starting a business); Number of days to register a business	Secondary / Objective	[16, 31]
1.2	Regulatory Sandbox Access	Effectiveness of innovation-oriented sandbox regimes (fintech, AI, blockchain)	Number of sandbox licenses granted per sector per year; Average time-to-sandbox approval (months); Perceived sandbox accessibility (5-point Likert)	Mixed (objective + survey)	[35-36] Founder survey
1.3	Venture Capital & Financial Support	Availability and accessibility of startup financing	VC investment volume (USD million/year); Number of active VC funds; Perceived access to early-stage capital (5-point Likert)	Mixed	[38] Founder survey
1.4	Intellectual Property Protection	Strength of IP enforcement relevant to innovation	IP Protection Index score; Number of startup patent applications filed per year; Perceived IP security (5-point Likert)	Mixed	[16]; Founder survey
1.5	Administrative Transparency	Efficiency and fairness of investment approval processes	Control of Corruption Index; Perceived transparency of licensing process (5-point Likert); Average investment approval time (days)	Mixed	[31]; Founder survey
Informal institutions					

2.1	Digital Social Capital	Density and quality of digital trust networks among ecosystem actors	Number of active digital connections per founder (LinkedIn/Zalo/professional platforms); Frequency of online knowledge-sharing activities (survey); Perceived digital trust in peer networks (5-point Likert)	Survey + proxy count	Founder survey; [26-27]
2.2	Innovative Entrepreneurial Culture	Prevalence of risk tolerance, innovation orientation, and growth mindset	GEM Total Early-stage Entrepreneurial Activity (TEA) rate; Fear of failure rate (GEM); Perceived social status of entrepreneurs (5-point Likert); Entrepreneurial intention score	Mixed (secondary + survey)	[17]
2.3	Mentorship & Network Connectivity	Accessibility and quality of mentorship and peer startup networks	Number of active mentors per startup cohort; Perceived quality of mentor access (5-point Likert); Network density score (number of cross-sector connections)	Survey + secondary	Accelerator/incubator records; Founder survey
2.4	Reputational Ecosystem	Social norms around failure, success narratives, and role model visibility	Media sentiment index for startup coverage; Perceived social acceptance of entrepreneurial failure (5-point Likert); Number of prominent local startup role models cited by founders	Mixed	Media analysis; Founder survey
Mediating variables					
3.1	Digital Transformation Capacity (Mediator: H4, H5)	Enterprise-level DT readiness and implementation	Digital Maturity Score (self-assessed, 5-point scale); % of core business processes digitized; Adoption of cloud, AI, or digital payment tools (binary checklist)	Survey	Founder survey; [6, 37]
3.2	Digital Networking & Mentorship Connectivity (Mediator — H5)	Degree of integration into digital knowledge and mentorship networks	Frequency of participation in online startup communities (per month); Number of digital mentorship sessions per quarter; Perceived network value (5-point Likert)	Survey	Founder survey; [13]
3.3	Entrepreneurial Perception (Mediator: H6)	Founder's cognitive assessment of opportunity, risk, and success feasibility	Perceived opportunity availability (GEM item); Risk perception scale (adapted from GEM); Self-efficacy for entrepreneurship (3-item Likert scale)	Survey	[1,17]
3.4	Post-Crisis Adaptation Capability	Firm-level resilience and pivoting capacity under external shocks	Number of business model pivots post-COVID (count); Revenue recovery rate (% of pre-shock baseline); Perceived organizational adaptability (5-point Likert)	Mixed	Founder survey; [7]
Moderating variables					
4.1	Industry / Sector Type (Moderator, H7)	Technology intensity and regulatory complexity of the	Sector classification (AI / Fintech / Green-tech / Circular / Digital Logistics / Other); Technology-intensity index (based on R&D	Categorical + secondary	[16, 36]

		startup's primary sector	expenditure ratio); Regulatory friction score by sector		
4.2	Geographic Region (Moderator, H8)	Institutional development and ecosystem density of the startup's operating region	Regional Competitiveness Index (PCI Vietnam score); Ecosystem density proxy (number of incubators, accelerators, co-working spaces per province); Urban/peri-urban/rural classification	Secondary	[14,36]
4.3	Degree of Ecosystem Internationalization (Moderator, H8)	Extent of cross-border capital, talent, and knowledge integration	% of VC funding from foreign sources; Number of international co-founders or advisors; Cross-border partnership count; Diaspora network engagement score (5-point Likert)	Mixed	[[19,38]; Founder survey
4.4	DT Ecosystem Maturity (Moderator, H9, contingent)	Aggregate digital readiness level of the ecosystem enabling DT's moderating role	National Digital Competitiveness Index score; Province-level internet penetration rate; % of ecosystem actors using shared digital infrastructure	Secondary	[17,31]
Dependent variables					
5.1	Startup Performance (Multi-dimensional)	Financial performance	Annual revenue growth rate (%); Time to first revenue (months); Profitability achievement (binary: yes/no within 3 years)	Mixed	Founder survey + financial records
5.2	Startup Performance	Innovation output	Number of patents or IP filings; Number of new products/services launched per year; R&D expenditure as % of revenue	Mixed	Founder survey + secondary
5.3	Startup Performance	Ecosystem integration & scaling	Number of strategic partnerships formed; Market expansion (domestic + international markets entered); Team size growth rate (%)	Survey + secondary	Founder survey; [12]
5.4	Startup Performance	Social & environmental impact	ESG self-assessment score; Social beneficiaries reached (count); Carbon footprint reduction (% if applicable)	Survey	Founder survey; [32]

Note: 5-point Likert scales use anchors: 1 = Strongly Disagree / Very Low to 5 = Strongly Agree / Very High. All survey items should undergo pilot testing for reliability (Cronbach's $\alpha \geq 0.70$) and convergent/discriminant validity ($AVE \geq 0.50$; $CR \geq 0.70$) prior to large-scale deployment. Secondary indicators serve as contextual anchors for multi-level modeling and should be matched to the appropriate unit of analysis (firm, region, or ecosystem level).

Founder survey' denotes primary data to be collected via a structured questionnaire administered to startup founders in future empirical studies; it does not refer to an existing published source.

5.3. Conceptual Diagram

The static architecture of the framework is depicted in Figure 1 below. Formal and informal institutional components occupy the left-hand antecedent tier, feeding into entrepreneurial orientation, founding decisions, and startup performance outcomes on the right. Mediating variables form the central transmission channel, while moderating variables appear as contextual boundaries shaping the strength and direction of each path.

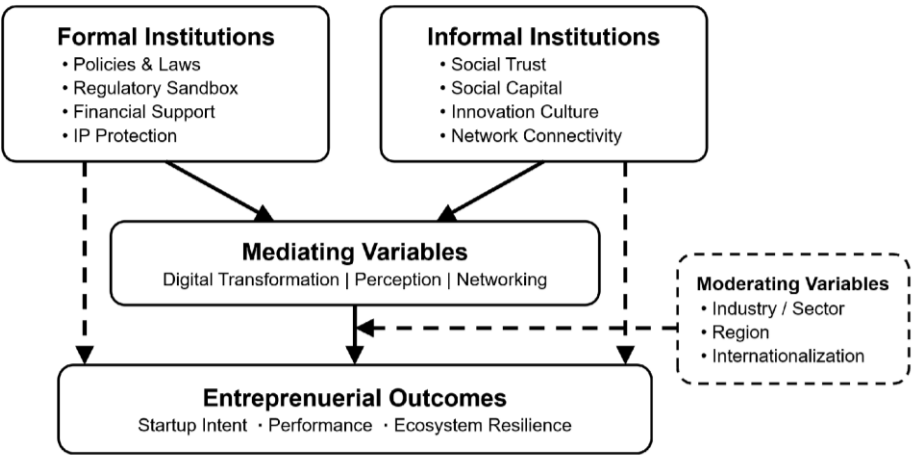


Figure 1. Multi-Level Conceptual Framework for Innovation-Driven Startup Ecosystems

5.4. Distinctive Contributions of the Framework

The framework's theoretical contributions relative to prior work are discussed in detail in Section 9.1. In brief, the architecture advances the literature by integrating formal and informal institutions within a unified three-tier causal structure, explicitly specifying mediating and moderating mechanisms, and incorporating Vietnam-specific institutional features, including regulatory sandbox regimes, digital social capital, and diaspora-driven connectivity, that generic emerging market models have not adequately theorized.

6. DYNAMIC CAUSAL LOGIC AND SCENARIO-BASED VALIDATION OF THE FRAMEWORK

6.1. Static Architecture and Dynamic Interaction

While Section 5 defines the structural components of the framework, this section addresses a fundamentally different question: how do these components interact over time, across sectors, and under varying contextual conditions? Translating a conceptual model into explanatory and predictive power requires specifying the causal pathways, directionality of effects, and conditions under which institutional configurations produce different entrepreneurial outcomes [37].

The core causal logic of the framework can be summarized as follows: formal and informal institutional components exert a synergistic but conditionally effective influence on entrepreneurial orientation and startup performance. Their impact achieves practical efficacy only when key mediating channels (digital adaptation, networked mentoring, perception alignment) are active, and is further shaped by sector-, regional-, and internationalization-specific moderating conditions [31, 34, 36].

Critically, the relationship is non-compensatory in one direction but partially compensatory in the other. Strong formal institutions alone, in the absence of supportive informal factors such as social capital or cooperative culture, do not guarantee optimal policy effectiveness. Conversely, a strong innovation culture and wide-reaching networks can enable startups to access resources through crowdfunding, peer mentorship, or diaspora networks, even where formal institutional support remains insufficient [17, 19].

6.2. Temporal and Lifecycle Dynamics

The framework's dynamic dimension captures lifecycle variation in how institutions shape startup trajectories across four stages: (i) ideation and early incubation; (ii) venture formation and early growth; (iii) scaling and market expansion; and (iv) digital and international integration. At the ideation stage, informal institutions, particularly entrepreneurial culture, peer networks, and mentorship accessibility, exert the most direct influence on founding intent [17, 37]. As ventures scale, formal institutions, including regulatory clarity, IP protection, venture capital access, become increasingly decisive. Moderating factors such as sector and degree of internationalization shift in salience across the lifecycle, with AI and green-tech startups facing distinct regulatory and cultural friction at each stage [32, 36, 38].

This lifecycle-sensitive logic implies that policy interventions should not be uniform: instruments effective at incubation (e.g., sandbox access, accelerator culture) differ from those that drive scaling (e.g., international venture capital pathways, SAFE/convertible note structures, cross-border IP frameworks). The framework's moderating layer explicitly accommodates this variation, providing a basis for differentiated, stage-tailored policy design. Table 3 synthesizes these stage-differentiated dynamics, mapping the dominant institutional driver, key mediating channel, critical moderator, and recommended policy instruments for each of the four lifecycle stages, together with an assessment of global macroeconomic sensitivity.

Table 3. Lifecycle-Differentiated Priorities

Lifecycle Stage	Dominant Institutional Driver	Key Mediating Channel	Critical Moderator	Recommended Policy Instruments	Global Macro Sensitivity
Stage 1: Ideation & Early Incubation	Informal institutions (culture, peer networks, mentorship)	Entrepreneurial perception (H6)	Geographic region (urban vs. transitional)	Accelerator culture programs; Entrepreneurship education; Role model visibility campaigns; Failure-tolerance norms	Low, primarily domestically driven
Stage 2: Venture Formation & Early Growth	Formal institutions (legal registration, seed capital, early sandbox access)	Digital transformation capacity (H4)	Sector type (AI/fintech vs. social impact)	Streamlined business registration; Seed fund co-investment programs; Sandbox entry pathways for tech-intensive sectors; IP fast-track	Moderate, FX availability, early VC flows
Stage 3: Scaling & Market Expansion	Formal institutions (VC infrastructure, IP protection, regulatory clarity)	Digital networking & connectivity (H5)	Degree of internationalization	International VC pathways (SAFE/convertible notes); Cross-border IP frameworks; Growth-stage equity tax incentives; Diaspora network activation	High, global VC cost of capital, trade conditions

Lifecycle Stage	Dominant Institutional Driver	Key Mediating Channel	Critical Moderator	Recommended Policy Instruments	Global Macro Sensitivity
Stage 4: Digital & International Integration	Formal + Informal institutions (complementary)	All three mediators active simultaneously	Global macroeconomic & geopolitical context	Cross-border regulatory harmonization; AI/fintech international sandbox linkages; ESG reporting frameworks; Global talent mobility programs	Very High , US-China tech decoupling, supply chains, FDI

Note: Institutional salience is not mutually exclusive across stages; rather, the dominant driver shifts progressively from informal (Stage 1) to formal (Stages 2–3) to complementary formal-informal (Stage 4). Global macro sensitivity increases monotonically with the degree of international integration.

6.3. Scenario-Based Plausibility Testing

To validate the framework's explanatory reach under diverse real-world conditions, three thought experiment scenarios are proposed, drawn from Vietnam's documented regional and sectoral heterogeneity.

Scenario A – Institutional Alignment in a Metropolitan Innovation Hub (Ho Chi Minh City): In a context where formal institutions are relatively strong, including robust sandbox regulations for blockchain and AI, active government-accelerator partnerships, and streamlined venture capital frameworks, startups in green-tech and AI sectors can swiftly mobilize international capital and expand market reach. This effect is amplified by strong mediating channels: high digital transformation readiness, dense international mentorship networks, and an entrepreneurial culture that valorizes calculated risk-taking [17, 34, 36]. The moderating role of sector is pronounced: AI and fintech startups benefit disproportionately from sandbox access, whereas social-impact ventures may face cultural barriers to investor credibility not addressed by formal policy alone.

Scenario B – Informal Institutional Substitution in a Transitional Region (Mekong Delta): In regions characterized by institutional underdevelopment, such as limited procedural support, weak venture capital penetration, and nascent regulatory frameworks, dynamic local social networks and academic communities can partially substitute for absent formal infrastructure. Founders leverage digital social capital, peer mentorship, and crowdfunding platforms to access markets and talent, demonstrating that the mediating channel of networked connectivity can sustain entrepreneurial activity even where formal institutional preconditions are unmet [13]. The regional moderator is decisive here: the same startup profile that thrives in HCMC through institutional complementarity may require a fundamentally different resource mobilization strategy in transitional contexts.

Scenario C – Sector-Specific Moderation in Green and Circular Economy Startups: In areas prioritizing smart tourism, green logistics, or circular economy ventures, a targeted policy environment, including regional incentive schemes, impact investment mechanisms, and ESG-aligned public procurement, interacts with the sector moderator to channel institutional support toward high-social-value entrepreneurship [32, 39-40]. This scenario highlights that the moderating effect of sector reflects fundamentally different institutional demands: circular economy startups require both regulatory sandboxes and consumer trust infrastructure, which a uniform institutional model cannot capture.

Overall, these three scenarios affirm the framework's empirical testability and practical applicability across Vietnam's heterogeneous startup landscape, which is well-suited for validation through multi-level structural equation modeling, comparative case analysis, or mixed-method survey designs, as outlined in Section 8.

7. PROPOSED HYPOTHESES

Table 4 provides a structured overview of all mediating and moderating variables in the framework, specifying their primary theoretical role, level of analysis, operative conditions, and associated hypotheses. This summary is intended to clarify the distinct conceptual function of each variable prior to the formal statement of hypotheses below.

Table 4. DT Dual Role / Mediator-Moderator Summary

Variable	Primary Role	Level of Analysis	Operative Condition	Relevant Hypotheses
Digital Transformation Capacity	Mediator	Firm-level	Always operative when institutional inputs are present	H4, H5
Digital Networking & Mentorship	Mediator	Firm/Network-level	When digital platforms and peer connections are accessible	H5
Entrepreneurial Perception	Mediator	Individual-level	When policy communication and culture signals are strong	H6
Industry/Sector Type	Moderator	Sector-level	Varies by technology-intensity of the sector	H7
Geographic Region	Moderator	Regional-level	Varies by institutional development of the region	H8
Degree of Internationalization	Moderator	Ecosystem-level	Varies by openness to global capital and knowledge flows	H8
DT Ecosystem Maturity (secondary)	Moderator	Ecosystem-level	Contingent, only when aggregate DT reaches threshold	H9
Regulatory Sandbox Participation	Moderator	Firm/Policy-level	When sandbox programs are actively accessed	H9

Digital transformation appears in both the mediator and moderator columns to reflect its dual theoretical role, which operates at different levels of analysis and under different operative conditions. This distinction is elaborated in Section 6.2.

For investigating the “Direct effects of institutional components on entrepreneurial activity”, the following hypotheses are proposed:

- H1: Formal institutions (policy, legal structure, regulatory sandboxes, financial support) exert a positive impact on both the intent and effectiveness of entrepreneurial activities in Vietnam.
- H2: Informal institutions (social trust, digital social capital, innovation-driven community culture, risk acceptance attitudes) positively influence entrepreneurial intent and performance.

- H3: The impact of formal institutions is strengthened when complemented by supportive informal institutions; in other words, the interactive effect between these two institutional groups amplifies startup success.

In addition, to explore “Mediating mechanisms”, we develop other hypotheses as follows:

- H4: The degree of digital transformation/adaptation within enterprises mediates the effect of institutional or policy interventions on entrepreneurial outcomes (e.g., sandbox-based policies or digital support programs enhance startups’ market opportunities through digital implementation).

- H5: Digital/social capital and network connectivity mediate the link between supportive policies/the enabling environment and firm-level performance in sectors such as technology, AI, and the green economy.

- H6: Perception (regarding entrepreneurial opportunities, risk/success) mediates the relationship between policy communication/entrepreneurial culture and new venture intentions and actions.

Finally, to uncover “Moderating effects”, the following hypotheses are proposed:

- H7: The relationship between formal institutions and entrepreneurial outcomes is moderated by industry/sector, with more pronounced effects in green technology, AI, circular economy, and digital logistics domains.

- H8: The influence of both formal and informal institutions on entrepreneurial outcomes is moderated by geographical region, degree of ecosystem internationalization, and prevailing global macroeconomic and geopolitical conditions. Identical domestic institutional configurations produce materially different startup performance outcomes depending on the availability of foreign venture capital, the stability of technology supply chains, and the degree of bilateral regulatory convergence relevant to the startup's sector.

- H9: The effect of innovative entrepreneurial culture on startup performance is moderated by the degree of engagement in local incentive programs, sandbox participation, and digital transformation initiatives; these effects are especially salient among social-impact, green, and circular startups.

Table 5 provides a consolidated summary of all nine hypotheses, specifying the construct relationships, type of effect (direct, mediation, or moderation), independent and dependent variables, mediator/moderator roles, and alignment with the three research questions.

Table 5. Hypothesis Summary

Hypothesis	Statement (Summary)	Type	IV	DV	Mediator / Moderator	RQ Alignment
H1	Formal institutions → ↑ entrepreneurial intent & effectiveness	Direct effect	Formal Institutions	Startup Performance	-	RQ1
H2	Informal institutions → ↑ entrepreneurial intent & performance	Direct effect	Informal Institutions	Startup Performance	-	RQ1
H3	Formal × Informal interaction → amplified startup success	Interaction effect	Formal + Informal Institutions	Startup Performance	-	RQ1
H4	Digital transformation mediates institutional → outcome path	Mediation	Formal Institutions (sandbox, DT policy)	Startup Performance	DT Capacity (Mediator)	RQ2
H5	Digital/social capital & networking mediate policy → performance	Mediation	Formal + Informal Institutions	Firm-level Performance	Digital Networking (Mediator)	RQ2
H6	Entrepreneurial perception mediates culture/policy → venture intent	Mediation	Informal Institutions + Policy Communication	New Venture Intention	Perception (Mediator)	RQ2
H7	Sector moderates formal institution → outcome relationship	Moderation	Formal Institutions	Startup Performance	Industry/Sector (Moderator)	RQ3
H8	Region, internationalization & global macro moderate informal institution effects	Moderation	Formal + Informal Institutions	Startup Performance	Region + Internationalization + Global Macro (Moderators)	RQ3
H9	Ecosystem DT maturity & sandbox engagement moderate culture → performance	Moderation	Entrepreneurial Culture	Startup Performance	DT Ecosystem Maturity + Sandbox Participation (Moderators)	RQ3

8. DISCUSSION, THEORETICAL IMPLICATIONS, AND LIMITATIONS

8.1. Discussion

The proposed multi-level conceptual framework advances the entrepreneurial ecosystem literature in three substantive directions. First, by integrating formal and informal institutional dimensions within a unified three-tier architecture comprising antecedent institutional components, mediating transmission channels, and moderating boundary conditions, the framework resolves a persistent segmentation problem that has characterized institutional research on entrepreneurship. Most extant models treat formal and informal institutions as

parallel but disconnected categories [29]. The present framework, by contrast, positions their interaction as the primary generative mechanism: the synergy and tension between institutional layers, not each layer in isolation, produces differential startup outcomes (H3). This resonates with Vargas-Zeledon and Lee's [13] finding that institutional configurations, rather than individual factors, are the operative units of analysis in inclusive entrepreneurship research.

Second, the framework's dynamic causal logic, articulated through lifecycle staging (Section 7.2) and scenario-based plausibility testing (Section 7.3), addresses a recognized weakness in static institutional models, namely their inability to explain why identical institutional conditions produce divergent outcomes across contexts [14, 20]. The thought experiments drawn from Vietnam's regional heterogeneity (HCMC, Mekong Delta, green/circular sectors) demonstrate that mediating channels shift in salience across lifecycle stages. Moderating variables, particularly sector type and degree of internationalization, fundamentally alter the pathways through which institutional support reaches startup performance. This lifecycle-sensitive perspective responds directly to GEM's observation that entrepreneurial intent and firm survival are shaped by distinct institutional configurations at different development stages.

Third, the explicit incorporation of Vietnam-specific institutional features such as regulatory sandbox regimes for fintech and AI, digital social capital formation, and diaspora-driven international connectivity [36] moves beyond generic emerging market theorization. The framework demonstrates that institutional arrangements in digital-transition economies cannot be adequately modeled by transplanting frameworks developed for OECD contexts. This is consistent with Tran Thanh Truc et al.'s analysis [18] of Vietnam's distinctive institutional nexus and Kanemoto et al.'s evidence on venture capital-backed founders in Vietnam [19].

8.2. Theoretical Implications

The framework carries three categories of theoretical implication, each directed at a distinct scholarly audience.

Implication 1. Theory extension in entrepreneurial ecosystem research: The framework extends Stam and Spigel's [3] ecosystem theory by operationalizing digital social capital and sandbox mechanisms as independent theoretical constructs with distinct causal roles, rather than treating them as policy instruments subsumed under formal institutions. This re-categorization is consequential: it implies that digital social capital operates through behavioral channels (perception, networking) rather than regulatory channels, and therefore requires different measurement strategies and policy interventions than conventional formal institutional variables. Future theoretical work should explore whether this distinction holds across different digital maturity levels in emerging economies.

Implication 2. Methodology for conceptual framework research: The use of theoretical triangulation across institutional economics [25], entrepreneurial ecosystem theory [3], and social capital theory [26, 27] validates internal consistency across analytical levels. This approach represents a replicable protocol for conceptual synthesis in management research [22, 23]. This methodological transparency is particularly important for theory-building papers in emerging market contexts, where empirical validation is constrained by data availability and institutional volatility.

Implication 3. Multilevel modeling agenda: The framework's three-tier architecture, with nine testable hypotheses organized into direct effects (H1–H3), mediation paths (H4–H6), and moderation boundaries (H7–H9), provides a directly operationalizable template for multilevel structural equation modeling (ML-SEM). The separation of mediators and moderators into distinct conceptual roles enables researchers to specify cross-level interaction effects with precision, particularly in designs that combine firm-level survey data with regional

institutional indicators. This bridges a methodological gap identified by Wurth et al., who noted that most EE research lacks the formal causal specification necessary for rigorous multilevel testing [41].

8.3. Limitations and Future Research Directions

Several limitations circumscribe the present study's scope and should be acknowledged explicitly to guide future empirical work.

Limitation 1. Absence of empirical validation: As a conceptual synthesis, the framework has not been subjected to statistical testing against primary data. The thought experiment scenarios, while grounded in documented regional and sectoral evidence from Vietnam, are plausibility arguments rather than causal proofs. The nine hypotheses remain propositions awaiting empirical adjudication. Future research should prioritize large-scale validation through ML-SEM using multi-source datasets combining firm-level surveys, regional governance indicators, and longitudinal performance data. Mixed-methods designs pairing quantitative hypothesis testing with in-depth case analysis of sandbox participants would be particularly well-suited to capturing the lifecycle dynamics theorized in Section 7.2.

Limitation 2. Vietnam-specific boundary conditions: Although the framework is designed with portability to comparable emerging markets in mind, its core constructs reflect Vietnam's specific institutional trajectory, including sandbox regulatory architecture, digital social capital norms, and diaspora connectivity mechanisms, as documented in recent policy reports [31, 36]. Direct transferability to other emerging economies (e.g., Indonesia, Bangladesh, Sub-Saharan African contexts) should not be assumed without contextual re-specification of institutional components and moderating variables. Comparative studies applying the framework across multiple emerging market contexts would constitute a valuable research extension.

Limitation 3. Exogenous macroeconomic and geopolitical factors: The framework focuses primarily on the internal dynamics of Vietnam's startup ecosystem, covering institutional configurations, mediating channels, and contextual moderators, but does not systematically model the influence of external macroeconomic shocks and geopolitical forces on internationally oriented startups. Global inflationary pressures, supply chain disruptions, and geopolitical realignments such as US-China technology decoupling represent exogenous boundary conditions that can materially amplify or suppress the efficacy of domestic institutional arrangements [17, 31]. Their downstream effects on semiconductor access, cross-border investment flows, and regulatory convergence are particularly consequential for technology-intensive startups seeking international expansion. Future iterations of the framework should incorporate a global macroeconomic moderator to account for these externally generated constraints on ecosystem performance. Candidate indicators include the Global Economic Policy Uncertainty Index, bilateral trade tension indices, and foreign direct investment volatility measures.

Limitation 4. Measurement operationalization: Section 6 specifies the conceptual architecture of mediating and moderating variables, and Table 1 proposes preliminary indicator proxies. However, the precise operationalization of latent constructs such as digital social capital, entrepreneurial perception, and ecosystem internationalization remains an open methodological challenge. Existing survey instruments and secondary data sources provide partial coverage, but validated measurement scales tailored to Vietnam's digital entrepreneurial context are not yet available. Scale development studies employing exploratory and confirmatory factor analysis across representative founder samples are a necessary precursor to large-scale hypothesis testing.

9. CONCLUSION

This study develops an integrated multi-level framework explaining how the dynamic interaction of formal institutions, informal institutions, and their mediating and moderating mechanisms shapes innovation-driven startup ecosystems, with particular application to Vietnam's rapidly evolving digital economy. The framework advances existing theory by resolving the static, domestically bounded limitations of prior models: it explicitly specifies nine testable hypotheses organized into direct institutional effects (H1–H3), mediating pathways (H4–H6), and moderating boundary conditions (H7–H9), including a novel global macroeconomic and geopolitical moderator that reflects the exogenous constraints facing internationally oriented startups in the post-pandemic era. Scenario-based plausibility testing across Vietnam's documented regional and sectoral heterogeneity confirms the framework's explanatory reach and its practical utility for stage-differentiated policy design. The study thereby establishes both a novel theoretical foundation and a directly operationalizable research agenda for empirical validation via multilevel structural equation modeling, mixed-methods designs, and comparative cross-country analysis in digital-transition economies.

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