

Community-anchored Pentahelix: Regional digital startup ecosystems

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Abstract

Informal community organizations in emerging economies face a paradox: lacking formal authority and resources, yet becoming essential anchors for digital startup ecosystems. This study examines that paradox through Malang Raya's ecosystem, showing how STASION, a community-led organization without formal mandates, achieved normative legitimacy to anchor regional innovation. Through institutional and stakeholder theory, we show that community actors in resource-constrained regions operationalize gotong royong (Indonesian mutual cooperation) to bridge institutional voids, offset weak government urgency, and translate national programs into locally grounded practices. Using a qualitative case study, we analyzed 12 stakeholders across five Pentahelix groups in Indonesia's National 1000 Digital Startups Movement. Findings reveal a regional-adapted Pentahelix model with three dominant pillars government, academia, and community; and industry and media in supporting roles. Rather than the balanced five-stakeholder engagement idealized in metropolitan contexts, regional success depends on community-mediated institutional translation, trust-based resource-sharing, and cultural alignment. Six critical success factors emerged: power distribution, trust relationships, regional readiness, resource availability, challenge navigation, and opportunity exploitation. This finding, theorised here as paradoxical compensation, repositions community from supporting pillar to compensatory mechanism, challenging traditional Pentahelix assumptions and offering strategic guidance for policymakers designing non-metropolitan innovation programs across Southeast Asia.

Keywords: Digital entrepreneurship, Innovation ecosystems, Multi-stakeholder collaboration, Regional development, Emerging economies.

Introduction

Digital startups have become crucial indicators of economic and technological advancement, driving growth through job creation, competition, and digital transformation. Indonesia's digital economy exemplifies this potential, reaching US\$82 billion in Gross Merchandise Value and projected to grow to US\$109 billion by 2025 (Google, Temasek and Bain, 2023). This growth is supported by substantial demographic advantages, 282.4 million people with 78.19% internet penetration (APJII, 2023) creating fertile ground for digital innovation. Despite promising national indicators, Indonesia's digital economy exhibits notable geographic inequality. This disparity is evident in regional startup ecosystems: Jakarta ranks 27th globally, while other cities remain within the top 1000 (Global Startup Ecosystem Index, 2024). Uneven development manifests in fragmented markets, regulatory complexity across regions, and disparities in digital infrastructure and literacy. The SMERU Institute (2021) identifies systemic regional challenges including extended market development timelines, limited investor understanding of local contexts, and digital talent scarcity. These structural issues, coupled with macroeconomic pressures and shifting investment climates, contribute to market volatility affecting numerous ventures nationwide (Setyowati, 2023).

To address regional development challenges, Indonesia has moved beyond traditional triple-helix models (government, academia, industry) to adopt the Pentahelix framework, a significant evolution in collaborative innovation theory. Conceptualized by Fyodorov et al. (2012), the Pentahelix model emerged from understanding that successful innovation ecosystems in developing economies require broader stakeholder engagement and local adaptation. This framework acknowledges that sustainable development requires institutional support, social acceptance, and cultural alignment through five key stakeholders: Government (regulatory support and policy), Academia (research and talent development), Industry (market access and business insights), Community Organizations (cultural alignment and grassroots support), and Media (information flow and digital literacy promotion). The framework's relevance to Indonesia stems from unique environmental factors: decentralized governance requiring multi-level coordination, geographical fragmentation and cultural diversity necessitating community involvement, and varying digital literacy levels highlighting media's essential role. The Pentahelix framework has been operationalized through initiatives like the National 1000 Digital Startups Movement.

However, real-world applications reveal significant contextual variations challenging universal applicability. Current applications demonstrate markedly different dynamics across contexts, revealing critical gaps necessitating theoretical and practical adaptation for emerging economy settings. In developed economies, the Pentahelix model operates within established institutional frameworks with balanced stakeholder power. Finland demonstrates strong government-academia-industry coordination supported by well-defined media roles and active civil society (Sotarauta and Srinivas, 2006). Conversely, emerging economy applications reveal fundamentally different dynamics. Brazil's creative economy shows community organizations assuming enhanced roles due to weaker formal institutional support, while media engagement remains sporadic (Barbulescu and Constantin, 2019). Malaysia demonstrates successful stakeholder coordination in metropolitan areas like Kuala Lumpur but struggles in regional contexts where institutional capacity varies dramatically (Razak and White, 2015). Thailand

exhibits similar metropolitan-regional disparities, with effective Bangkok collaboration contrasting sharply with fragmented stakeholder relationships in secondary cities (Wonglimpiyarat, 2016). Most critically, existing Indonesian Pentahelix applications have primarily focused on tourism development and creative industries rather than digital startup ecosystems (Hafidz et al., 2023; Susanti et al., 2021; Wahida et al., 2020, 2022). These studies reveal important contextual adaptations: government stakeholder dominance due to hierarchical cultural norms, community organizations bridging formal gaps, and underdeveloped media roles. However, none examine how these adaptations specifically influence digital startup development or address unique regional ecosystem challenges beyond metropolitan centers.

This comparative analysis reveals three critical gaps necessitating Pentahelix model reimagining. First, institutional asymmetry, unlike developed economies where formal and informal institutions (North, 1990) align relatively well, emerging economies demonstrate significant gaps requiring community organizations to assume roles typically filled by government or industry. Second, metropolitan bias, existing frameworks assume uniform institutional capacity across regions, failing to account for stark disparities characteristic of emerging economies. Third, sectoral specificity, previous applications in tourism and creative industries operate under different institutional logics than digital startups requiring rapid scaling, technology infrastructure, and venture capital access. Despite the National 1000 Digital Startups Movement's structured approach, Bachtiar et al. (2023) note that significant inequality between metropolitan and regional ecosystems persists, suggesting that implementation requires careful local adaptation. Current Indonesian Pentahelix research has primarily focused on non-startup collaborations, with limited exploration of stakeholder collaboration within regional startup ecosystems. Scholars emphasize understanding how different collaborative approaches influence micro-processes such as trust, power, readiness, and time in regional development (Kriz, Bankins, and Molloy, 2018; Hasche, Höglund and Linton, 2020). This research gap is particularly significant given that existing models inadequately address how institutional factors influence stakeholder collaboration in regional digital startup development, especially within national innovation programs in emerging economies.

This study addresses these gaps by analyzing institutional dynamics in Malang Raya's digital startup ecosystem. Malang Raya presents an ideal case study as East Java's second-largest region in university presence and startup density (MIKTI, 2021), with significant digital talent potential among Millennials and Gen Z (BPS, 2023). By examining complex interplay between formal institutions (government policies and programs) and informal institutions (local innovation culture and community networks), this research proposes a modified Pentahelix collaboration model emphasizing local wisdom and sustainable capacity development. This study refines Institutional Theory by illustrating how regulatory frameworks interact with informal networks in shaping startup ecosystems, while extending Stakeholder Theory by reconceptualizing the Pentahelix framework to emphasize regional adaptation, ultimately examining how formal and informal institutional forces interact with stakeholder dynamics to shape regional innovation outcomes beyond metropolitan centers.

Literature Review

Digital Entrepreneurship and Startup Growth

Digital entrepreneurship has become a transformative force in modern economies, reshaping how businesses are created and operated. Hull et al. (2007) define digital entrepreneurship as leveraging technological advancements to establish innovative business models, while Davidson and Vaast (2010) expand this by incorporating opportunity pursuit through digital media and information communication technologies. Unlike traditional businesses, digital startups are characterized by scalability, rapid market expansion, and technology-driven innovation (Spender et al., 2017). These characteristics enable digital startups to disrupt conventional industries, fostering competitive and innovation-oriented markets. Digital startups play a particularly crucial role in emerging economies such as Indonesia, where the digital economy is projected to reach US\$360 billion by 2030, making it the largest in Southeast Asia (Google, Temasek, and Bain, 2022). However, digital startups face significant survival challenges. According to the SMERU Institute (2021), only 29% of startups in Indonesia survive beyond their third year, with many struggling due to extended market development timelines, limited investor understanding, and digital talent shortages (Setyowati, 2023). The economic downturn in 2023 further exacerbated these issues, leading to mass layoffs and business closures (Kominfo, 2023). Several studies have identified key factors influencing digital startup success or failure. Critical success factors include strong business ideas, competent teams, functional prototypes, and strategic relationships (Berkus, 2006), with venture capital and investor engagement playing pivotal roles (Vanacker et al., 2013; Collewaert, 2016). Additionally, digital infrastructure and policy support cannot be overlooked. Government-led initiatives such as the National 1000 Digital Startups Movement provide support systems for startups. However, disparities in regional digital readiness persist, highlighting the need for an ecosystem-based approach in fostering startup resilience (Bachtiar et al., 2023).

Entrepreneurial Ecosystem and Institutional Theory

The Entrepreneurial Ecosystem (EE) theory provides a structured framework for understanding complex interactions that drive startup growth. Cohen (2005) defines a sustainable EE as a network of interrelated players supporting new venture development. Expanding on this, Isenberg (2010) identifies six key elements: culture, policy, financing, human capital, market access, and institutional support. In Indonesia, while the digital entrepreneurial ecosystem has experienced rapid expansion, significant challenges remain in ensuring equal access to startup support mechanisms, particularly in regional areas (Bachtiar et al., 2023). Institutional theory plays a fundamental role in shaping startup development. North (1990) describes institutions as “the rules of the game in society,” encompassing both formal regulations (government policies) and informal norms (risk-taking behavior and social expectations). These institutions influence how startups navigate regulatory frameworks, access funding, and integrate into existing markets. DiMaggio and Powell (1983) highlight how institutional structures dictate organizational behavior, while Williamson (2000) emphasizes that institutional incentives shape strategic decisions of entrepreneurs and investors. Studies increasingly recognize the interplay between formal and informal institutions in fostering digital entrepreneurship. Moulaert and Hamdouch (2006) demonstrate that regional innovation cultures and social norms significantly impact startup success rates. Cooke (1997) argues that institutions play a

key role in technology adoption, regulatory adaptation, and market readiness. In Indonesia, regulatory uncertainties and inconsistent government policies have often hindered startup operations, particularly in sectors such as fintech and ride-hailing, where frequent policy shifts create instability (Kominfo, 2023). Moreover, Indonesia's entrepreneurial landscape has witnessed a shift from traditional family-based business networks to more community-driven startup ecosystems (Bachtiar et al., 2023). This transformation is evident in startup hubs such as Jakarta, Bandung, and Yogyakarta, where coworking spaces, accelerators, and regional innovation centers have become critical ecosystem enablers. However, aligning national startup policies with local needs remains a challenge. Mazzucato (2013) argues that government policies should co-evolve with technological advancements to provide adaptive support for startups. This highlights the importance of collaborative governance models, further explored in the Pentahelix framework.

Pentahelix Collaboration in Digital Startup Ecosystem

The evolution from Triple Helix to Pentahelix has reshaped how stakeholder collaboration is understood in innovation ecosystems. Initially introduced by Etzkowitz and Leydesdorff (1995), the Triple Helix model emphasized interaction between university, industry, and government in driving innovation. The model later expanded into the Quadruple Helix, incorporating civil society (Fyodorov et al., 2012), and subsequently evolved into the Pentahelix model, integrating media as a fifth key stakeholder (Halibas et al., 2017). The Pentahelix model promotes coordinated collaboration among five key actors: academia, business, government, community, and media. Awaluddin et al. (2016) and Halibas et al. (2017) demonstrate how this framework enhances digital startup development by fostering multi-stakeholder engagement. Each actor plays a distinct role, academia generates knowledge and research, business provides market expertise and investment, government formulates policies and funding mechanisms, community supports grassroots innovation and early adoption, while media amplifies visibility and public engagement. Despite its benefits, challenges in Pentahelix implementation remain, particularly in emerging economies. Kriz, Bankins, and Molloy (2018) identify four critical processes affecting Pentahelix collaboration success: trust-building, power dynamics, regional readiness, and time. In Indonesia, research by Bachtiar et al. (2023) highlights significant disparities between metropolitan and regional startup ecosystems, necessitating tailored approaches to stakeholder collaboration. The National 1000 Digital Startups Movement initiative underscores the need for effective Pentahelix implementation, ensuring that collaborative mechanisms are adapted to regional contexts. While the Pentahelix model offers a structured approach to ecosystem development, its real-world application requires adaptive governance, equitable resource distribution, and stronger inter-stakeholder engagement. Future research should explore global best practices to refine the application of Pentahelix in the Indonesian digital startup landscape.

Theoretical Integration: From Traditional to Regional-Adapted Pentahelix Framework

Traditional Pentahelix models, as developed by Halibas et al. (2017) and applied in studies by Awaluddin et al. (2016), are often operationalized in contexts where stakeholder engagement across all five dimensions is assumed to be relatively balanced, with access to resources and decision-making power perceived as adequate. While the

original frameworks emphasize synergy rather than strict equality, many applications implicitly reflect mature institutional environments, sufficient resource availability, and established stakeholder networks conditions more typical of metropolitan or developed economy settings.

The regional-adapted Pentahelix framework developed in this study addresses limitations of traditional models through three interrelated theoretical innovations, each corresponding to specific dimensions in Table 1.

Table 1: Comparative framework analysis - traditional vs. regional-adapted pentahelix

Dimension	Traditional Pentahelix	Regional-Adapted Pentahelix (This Study)	Key References
Stakeholder Configuration	Balanced engagement across all five stakeholders	Three Dominant Pillars (Government, Academia, Community) with Industry and Media in supporting roles	Halibas et al. (2017); Awaluddin et al. (2016); Sudiana et al. (2020)
Power Distribution	Relatively equal power sharing among stakeholders	Asymmetrical power dynamics with community compensation mechanisms	Mitchell et al. (1997)
Institutional Foundation	Strong formal institutions with minimal informal intervention	Formal-informal institutional complementarity with community-mediated translation	North (1990); Helmke and Levitsky (2004)
Geographic Scope	Metropolitan-focused with uniform application	Regional-specific adaptation accounting for non-metropolitan constraints	Asheim and Gertler (2005); Lorenzen and Mudambi (2013)
Cultural Integration	Limited consideration of local cultural values	Explicit integration of traditional values (e.g., “gotong royong”) with modern innovation practices	Geertz (1963); Pranadji (2009); Hudalah et al. (2016)
Resource Access	Abundant resources with formal allocation mechanisms	Resource optimization through informal networks and alternative pathways	Acemoglu and Robinson (2012)
Implementation Logic	Top-down policy implementation	Bottom-up adaptive responses with institutional translation mechanisms	Barca et al. (2012)

Source: Developed for this research

First, as shown in *Stakeholder Configuration* and *Power Distribution* rows, the framework acknowledges that in resource-constrained regional contexts, stakeholder salience varies substantially depending on power, legitimacy, and urgency attributes (Mitchell, Agle, and Wood, 1997). This variation often leads to the emergence of three dominant pillars, Government, Academia, and Community while Industry and Media assume more supportive roles, contrasting with the balanced five-stakeholder engagement idealized in traditional models (Halibas et al., 2017; Awaluddin et al., 2016). Second, reflecting differences noted in the *Institutional Foundation* dimension, the framework incorporates institutional theory (North, 1990) to explain how formal and informal institutions interact through community-mediated translation processes. This approach addresses institutional asymmetries typical of emerging economy contexts, where weak formal mechanisms are often complemented by strong informal norms and practices (Helmke and Levitsky, 2004). Third, aligned with *Cultural Integration* and *Geographic Scope* rows, the framework integrates cultural-cognitive elements by mobilizing traditional collaborative values such as *gotong royong* (Indonesian mutual cooperation) to support modern innovation objectives (Geertz, 1963; Pranadji, 2009; Hudalah et al., 2016). This adaptation directly counters the metropolitan bias embedded in many traditional Pentahelix implementations (Asheim and Gertler, 2005; Lorenzen and Mudambi, 2013).

As a whole, this theoretical integration contributes to innovation ecosystem literature by demonstrating that effective stakeholder collaboration in regional contexts requires adaptive frameworks aligned with local institutional characteristics, cultural values, and resource constraints. Unlike traditional Pentahelix models that tend to replicate metropolitan stakeholder configurations, the regional-adapted model emphasizes optimization of available stakeholder capabilities and development of compensatory mechanisms when formal institutional support is insufficient (Barca et al., 2012). This represents a strategic shift from standardized implementation toward contextually sensitive approaches that leverage local strengths while maintaining coherence with broader innovation objectives.

Methodology

This study adopts a theory-building approach through a qualitative single-case study of Malang Raya's startup ecosystem, selected as a critical case (Yin, 2018) to examine how national innovation programs are translated and adapted within regional contexts. Guided by Saunders' (2016) research onion, the research applies a pragmatic philosophy with interpretive elements, employing abductive reasoning (Dubois and Gadde, 2002) to iteratively move between empirical observations and theoretical constructs to generate novel propositions.

Participants

Participants were recruited using the relationship-tree snowball sampling method (Kriz, Gummesson, and Quazi, 2014), a strategic adaptation of traditional snowball sampling that systematically maps interpersonal and inter-organizational connections, tracks referral pathways, and prioritizes actors situated at critical junctures in a network. In the Indonesian context, where hierarchical structures and formal introductions carry significant weight, this method proved particularly effective in securing access to

influential stakeholders, gaining credibility, and revealing both formal and informal power relations within the ecosystem. Through this approach, the study identified twelve informants spanning the five stakeholder categories of the original Pentahelix model: academia, government, business or industry, community, and media. All participants satisfied three inclusion criteria: they had direct involvement in the National 1000 Digital Startups Movement, they exerted a demonstrable influence on startup development either through resource provision, policy-making, or capacity-building, and they corresponded to Mitchell et al.'s (1997) salience attributes of power, legitimacy, and urgency. This composition allowed the research to capture perspectives ranging from national-level policymakers to local implementers, thereby ensuring a balanced yet contextually nuanced representation of the ecosystem. The final set of twelve informants, representing all five Pentahelix stakeholder categories, is presented in Table 2, which details their stakeholder affiliation, position, and gender while maintaining confidentiality through anonymized codes.

Table 1: Interviewee identifying details

No	Helix	Code	Position	Gender
1	HU (University)	DSA	Lecturer	M
2	HU	GWW	Lecturer	M
3	HG (Government)	ATA	Staff	M
4	HG	WHT	Top position	M
5	HG	MNW	Head of division	M
6	HG	ARR	Staff	F
7	HI (Industry)	GAA	Staff	F
8	HI	ANI	Staff	F
9	HC (Community)	MZA	Head of division	M
10	HC	APA	Head of division	F
11	HM (Media)	DKA	Head of division	F
12	HM	RRI	Head of division	M

Note: M = male; F = female

Procedure and Data Analysis

The analysis process employed Creswell's (2016) systematic approach to thematic analysis, augmented with theory-building analytical procedures supported by NVivo 12 software. Data preparation involved integrating verbatim interview transcripts, compiled document materials, and field notes into a unified dataset. Following multiple close readings, inductive coding was undertaken using Gioia et al.'s (2013) methodology, progressing from first-order concepts to second-order themes and ultimately to aggregate theoretical dimensions. This coding process was accompanied by conceptual mapping, which systematically linked emergent patterns to established constructs from Institutional Theory and Stakeholder Theory, enabling cross-

theoretical integration that enriched the explanatory power of the framework. Analysis was conducted at three interdependent levels: the macro-level analysis examined formal policies, regulations, and informal cultural norms influencing stakeholder engagement; the meso-level analysis explored patterns of collaboration and interdependence among stakeholder groups; and the micro-level analysis focused on resource flows, innovation processes, and mechanisms of institutional translation and stakeholder compensation dynamics. This multi-level approach ensured that theoretical propositions were grounded in an integrated understanding of structural, relational, and processual dimensions of the ecosystem.

Criteria for inclusion and categorization of elements in the regional-adapted Pentahelix framework were established through a combination of theoretical alignment and empirical validation. Stakeholders were included if they met the criteria outlined in the participants section, while institutional forces were classified according to North's (1990) formal-informal distinction. Element prioritization was based on three validation benchmarks: frequency with which a theme emerged across data sources, theoretical significance in relation to existing literature, and demonstrable practical impact on ecosystem functioning. Elements consistently scoring high across all three benchmarks were designated as dominant pillars, while others were categorized as supporting elements. To ensure rigor and trustworthiness, the study applied multiple validation strategies, including triangulation of data sources, member checking with participants, prolonged engagement in the field, and adherence to Fatchan's (2004) quality criteria of credibility, dependability, transferability, and confirmability. By combining these measures with clear articulation of theory-building logic, explicit differentiation from existing Pentahelix models, transparent description of the synthesis process, and well-defined inclusion criteria, the methodology provides a robust and coherent foundation for the regional-adapted Pentahelix framework presented in the following sections.

Results

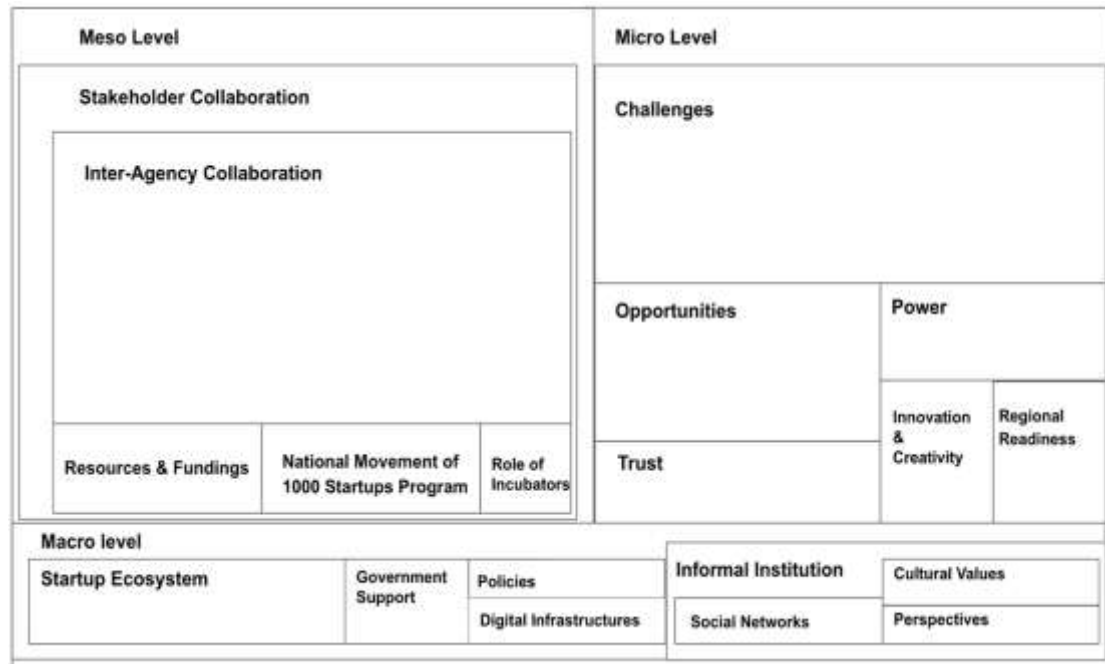
The analysis of Malang Raya's startup ecosystem reveals a multi-layered configuration in which institutional arrangements, stakeholder dynamics, and strategic collaborations interact to shape the region's digital innovation trajectory. Drawing on Institutional Theory (North, 1990) and Stakeholder Theory (Freeman, 1984), the findings are structured to address three analytical dimensions: (1) how institutional factors influence stakeholder roles, (2) how different actors interact and collaborate, and (3) how these dynamics inform the design of an enhanced strategic collaboration model to support the National 1000 Digital Startups Movement in Malang Raya.

Institutional Factors Affecting Startup Ecosystem (Macro-Level Analysis)

The institutional configuration of Malang Raya's startup ecosystem operates across three analytically distinct levels, macro, meso, and micro derived from a synthesis of Institutional Theory (North, 1990) and empirical coding of field data. The categorization of elements into these levels followed two criteria: (1) thematic alignment with North's formal-informal institutional distinction, and (2) empirical salience based on frequency and significance across interviews, documents, and field observations. This structured approach ensured that the multi-level framework is not

merely descriptive but theoretically grounded, allowing for systematic proposition development. As illustrated in Figure 1, the framework demonstrates how institutional arrangements both enable and constrain startup innovation, and how these arrangements interact dynamically across levels.

Figure 1: Multi-level institutional analysis framework of Malang Raya’s startup ecosystem



Source: Developed for this research

At the macro-level analysis, formal institutions encompass *Policy and Regulation*, including government support mechanisms, targeted digital infrastructure programs, and regulatory frameworks legitimizing technology-based entrepreneurship. These elements provide the foundational “rules of the game” structuring innovation activities, aligning with North’s (1990) conception of formal institutional constraints and enablers. Complementing these are informal institutional perspectives, social networks, cultural values, and shared regional norms which influence how stakeholders interpret and operationalize formal rules. In Malang Raya, strong informal networks and community-oriented cultural norms act as both facilitators and filters for digital innovation diffusion, shaping who gains access to opportunities and resources.

The meso-level analysis focuses on *Stakeholder Collaboration*, capturing operational mechanisms through which national policy initiatives are translated into regional practice. This includes inter-agency collaboration among government bodies, universities, industry associations, and community organizations, as well as resource and funding flows, local implementation of the National 1000 Digital Startups Movement, and the role of incubators in providing early-stage support. Inclusion of these elements was based on their repeated emergence in stakeholder narratives and their centrality in network mapping exercises, highlighting their role as connective tissue in the ecosystem. The quality and intensity of meso-level interactions often

determine whether startups can effectively leverage macro-level policies, making this layer critical for institutional translation.

At the micro-level analysis, six interrelated factors directly shape startup operations: operational challenges, perceived opportunities, power dynamics, innovation and creativity capacity, regional readiness for innovation, and trust among stakeholders. These factors emerged from granular coding of interview data, where founders and ecosystem actors described day-to-day realities of navigating resource constraints, competitive pressures, and partnership dynamics. Trust, in particular, functions as a pivotal informal mechanism enabling resource sharing and knowledge transfer in contexts where formal mechanisms are underdeveloped or slow to respond. The interplay of these micro-level factors creates heterogeneous operating conditions, explaining why startups with similar access to macro- and meso-level support may experience divergent growth trajectories. Taken together, the analysis shows that the effectiveness of macro-level policy interventions is contingent on meso-level collaboration quality and micro-level trust dynamics. Formal institutional structures provide necessary legitimacy and resources, but without adaptive meso-level translation and micro-level relational capital, their potential impact on startup performance remains under-realized.

Stakeholder Collaboration and Interaction in the Ecosystem (Meso-Level Analysis)

Analysis of stakeholder collaboration in Malang Raya's startup ecosystem draws on Mitchell et al.'s (1997) stakeholder salience model, focusing on the attributes of power, legitimacy, and urgency. Stakeholder categorization was conducted through iterative coding of interview transcripts, triangulated with relevant literature, and mapped against these three attributes. This approach ensured that inclusion and categorization of stakeholders into the Pentahelix framework were based on both empirical evidence and theoretical grounding. This meso-level analysis serves as a core building block in theory development for the revised Pentahelix model, as it links stakeholder attribute configuration to mechanisms of co-evolution, feedback loops, and influence pathways between institutional forces and ecosystem actors.

Government stakeholders emerge with high legitimacy and power through regulatory authority and control over funding, yet often exhibit limited urgency in responding to evolving startup needs. This asymmetry explains why government initiatives, while establishing essential frameworks and resources, frequently face challenges in timely and effective implementation. Power imbalances between government actors and startups create accountability gaps, as one informant noted, support can remain superficial because "they don't understand what is being worked on." Universities display varying degrees of salience. Large, research-intensive institutions such as Universitas Brawijaya demonstrate all three attributes, legitimacy via academic reputation, power through resource control, and urgency through mandated innovation agendas, making them definitive stakeholders. In contrast, smaller universities with fewer resources show lower salience, resulting in "structural holes" (Burt, 1992) in the knowledge network that weaken ecosystem cohesion. As one respondent observed, "Not all universities are open to startup-related programs. It depends on their focus," highlighting disparities in engagement.

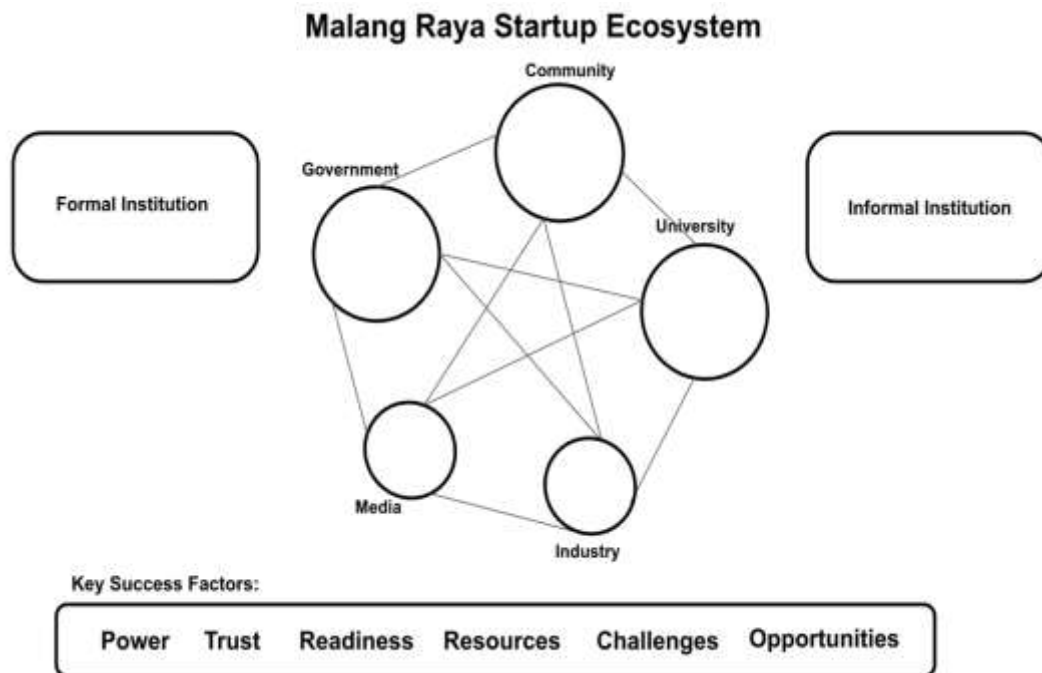
Community organizations, such as STASION, present a paradoxical case. Despite lacking formal power and pragmatic legitimacy, they possess strong urgency and “normative legitimacy” (Suchman, 1995) derived from consistent value delivery and deep understanding of grassroots needs. This enables them to effectively bridge institutional gaps, connecting formal support mechanisms with operational realities of startups. Industry stakeholders show selective involvement driven by instrumental interests (Jones, 1995) rather than sustained commitment to ecosystem development. Their engagement hinges on aligning strategic objectives with startup capabilities, yet, as one interviewee noted, “finding the right moment and connecting point” remains challenging. This misalignment constrains industry investment and limits potential synergies.

Media stakeholders, exhibiting low salience across all three attributes, tend to participate in an event-driven rather than continuous manner. This limits their capacity to facilitate sustained information flows and legitimacy-building functions identified by Rowley’s (1997) stakeholder network theory as critical for ecosystem vitality.

The meso-level configuration thus reveals a “stakeholder compensation mechanism” in which community actors build normative legitimacy to offset government’s lack of urgency, while elite universities anchor the system with high salience across all attributes. Industry’s selective engagement and media’s episodic involvement create bottlenecks in collaboration and information dissemination. This pattern illustrates how stakeholder salience shapes the ecosystem’s co-evolutionary dynamics: formal authority and resources at the macro-level analysis must be complemented by responsive, trust-based engagement at the meso-level and micro-level analyses to generate effective ecosystem outcomes. From a theory-building perspective, these findings form the empirical basis for propositions that can be tested in future research, for instance, examining how shifts in one attribute (e.g., urgency) influence collaborative effectiveness across the Pentahelix. Such validation could be pursued through multi-case comparative studies or longitudinal designs, both within Indonesia and across other Southeast Asian ecosystems facing similar institutional voids.

Strategic Collaboration Model for Enhancing Startup Success (Micro-Level Analysis)

The strategic collaboration model (Figure 2) synthesizes institutional theory and stakeholder theory into an integrated framework that explicates how formal rules, informal norms, and inter-stakeholder dynamics co-evolve to shape regional innovation trajectories. Unlike conventional Pentahelix models, which tend to present stakeholder roles in static configurations, the revised model developed in this study emphasizes *co-evolutionary alignment* between institutional layers and stakeholder interactions, accounting for feedback loops, adaptive responses, and culturally embedded mechanisms. This distinction is particularly salient for emerging economy contexts such as Malang Raya, where institutional voids and resource asymmetries necessitate adaptive collaboration strategies. Figure 2 depicts how formal institutions, Pentahelix stakeholders, and informal institutions (*gotong royong*) interact through six critical success factors.

Figure 2: Strategic collaboration framework of Malang Raya's startup ecosystem

Source: Developed for this research

As illustrated in Figure 2, the framework identifies six critical success factors that mediate effectiveness: Power (balanced distribution across stakeholders), Trust (reciprocal knowledge exchange), Readiness (innovation capacity, digital literacy, technical talent), Resources (access to infrastructure and support), Challenges (effective navigation of operational and policy obstacles), and Opportunities (strategic identification and exploitation of market prospects). The model situates the five Pentahelix stakeholder groups government, universities, community organizations, industry, and media within a dual-layer institutional environment. This environment comprises formal institutions (e.g., the National 1000 Digital Startups Program, regulatory frameworks, and government-led digital infrastructure initiatives) and informal institutions (e.g., the STASION Community, cultural values of *gotong royong*, and localized entrepreneurial networks such as MCF and KEK Malang). Formal institutions provide legitimacy, regulatory stability, and structured resource flows, while informal institutions foster trust, relational governance, and rapid adaptability in response to shifting market and policy conditions. A concrete example of *gotong royong* operationalization emerged in STASION's resource-sharing model: the organization facilitated shared access to co-working spaces, coding mentorship, and market intelligence among member startups without formal fee structures. Entrepreneurs contributed resources in kind, senior founders mentored juniors, successful companies shared client referrals with emerging peers, and community members volunteer-managed events and workshops. This mutual cooperation mechanism enabled resource-constrained startups to access professional services typically requiring substantial capital, while simultaneously building relational networks that strengthened long-term ecosystem resilience. This practice exemplifies how traditional cultural values translate into modern innovation infrastructure, creating social infrastructure that substitutes for missing formal institutions. Critically, this

adaptation reframes *gotong royong* from a village-based subsistence practice into a scalability mechanism: by pooling talent, shared infrastructure, and client access across firms, resource-constrained startups secured the rapid, low-cost capacity expansion they could not otherwise fund, substituting collective reciprocity for the venture capital and formal service markets concentrated in metropolitan ecosystems. Six key success factors underpin the model's operational viability: balanced distribution of power across stakeholders to prevent dominance by any single actor; trust-based relationships enabling reciprocal knowledge exchange; regional readiness in terms of innovation capacity, digital literacy, and technical talent; access to resources and infrastructural support; effective navigation of operational and policy-related challenges; and strategic identification and exploitation of emerging market opportunities. These factors function as mediating mechanisms, translating institutional structures and stakeholder attributes into tangible ecosystem outcomes.

Distinctively, the model identifies three *anchor stakeholders*, government, academia, and community that consistently drive ecosystem stability and innovation continuity in non-metropolitan settings. Government institutions ensure policy alignment and funding continuity, universities act as hubs for talent cultivation and R&D commercialization, and community actors bridge formal policy frameworks with on-the-ground entrepreneurial realities. Industry and media play complementary, albeit more variable, roles—industry providing selective market entry points and investment streams, and media contributing to visibility and legitimacy, albeit often episodically. By explicitly incorporating feedback mechanisms between institutional forces and stakeholder actions, the model advances beyond prescriptive Pentahelix typologies to offer a *dynamic, context-sensitive collaboration framework*. It demonstrates that in regions such as Malang Raya, the effectiveness of national innovation programs hinges on the capacity of community-led adaptive governance to close coordination gaps, translate formal mandates into actionable local strategies, and maintain stakeholder engagement amidst resource constraints. This reconceptualization offers a theoretically robust and contextually grounded pathway for designing ecosystem interventions that are not merely replicas of metropolitan models but are tailored to the socio-institutional realities of secondary cities in emerging economies.

Discussion

Propositions

Grounded in an abductive synthesis of stakeholder theory, institutional theory, and empirical insights from the Malang Raya case, this study formulates six theoretically grounded and testable propositions. The abductive logic emerged from iterative comparison between existing frameworks (e.g., Mitchell et al., 1997; North, 1990) and field evidence, ensuring that each proposition is both contextually anchored and generalizable for empirical testing.

P1: Institutional Complementarity Proposition — Robust informal institutions (e.g., community networks, cultural values such as *gotong royong*), strengthen the positive relationship between formal institutional support and startup ecosystem performance, generating synergistic effects that enhance resource accessibility and knowledge transfer.

P2: Three Dominant Pillars Configuration Proposition — In regional startup ecosystems, when industry and media stakeholders demonstrate low salience across power, legitimacy, and urgency dimensions, government agencies, universities, and community organizations will emerge as dominant ecosystem drivers, creating alternative support pathways.

P3: Regional Readiness Moderation Proposition — Regional readiness factors (digital infrastructure, technical talent, supportive policies) positively moderate the relationship between available innovation resources and startup performance, whereby higher readiness levels amplify resource utilization effectiveness.

P4: Stakeholder Compensation Mechanism Proposition — When formal stakeholders exhibit low urgency in startup support, informal stakeholders will develop normative legitimacy through consistent value delivery, creating compensatory mechanisms that bridge institutional gaps and maintain ecosystem functionality.

P5: Power-Trust Interaction Proposition — Inter-stakeholder trust levels mediate the relationship between stakeholder power asymmetries and collaboration effectiveness, whereby higher trust reduces the negative effects of power imbalances on resource flows and decision-making processes.

P6: Integrated Ecosystem Performance Proposition — The multiplicative interaction between institutional integration, stakeholder balance, and regional capabilities determines startup ecosystem sustainability, whereby stronger alignment across these dimensions enhances ecosystem resilience.

These propositions provide deep theoretical leverage by revealing co-evolutionary mechanisms between institutional forces and stakeholder dynamics that existing theories have not adequately captured. P1 and P4 illustrate *institutional-stakeholder co-evolution*, where informal institutions and community stakeholders simultaneously adapt to formal institutional gaps, creating feedback loops that strengthen both institutional complementarity and stakeholder compensation mechanisms. This dynamic challenges North's (1990) static institutional dichotomy by demonstrating how stakeholders act as institutional entrepreneurs, reshaping the environments in which they operate. P2 and P5 illuminate *stakeholder co-evolutionary dynamics*, where power asymmetries prompt trust-based compensatory responses that alter ecosystem configurations. In such cases, peripheral stakeholders enhance their influence through normative legitimacy (Suchman, 1995), which, in turn, reshapes stakeholder ecology and power distribution.

The empirical validation pathway for these propositions involves a staged research agenda:

1. Proof-of-concept pilot studies in 3-5 comparable regional ecosystems to assess construct validity and refine measurement instruments.
2. Large-scale multi-country validation using cross-sectional surveys ($n > 200$ ecosystems) and longitudinal panel designs with five measurement waves over three years, applying structural equation modeling (SEM), latent growth modeling, and stakeholder salience scoring based on Mitchell et al.'s (1997) framework.

3. Boundary condition testing through comparative case studies and fuzzy-set qualitative comparative analysis (fsQCA) to identify configurational patterns across diverse institutional contexts.

Cultural specificity of concepts such as *gotong royong* necessitates careful adaptation of instruments for non-Indonesian contexts, and establishing causality between institutional complementarity and ecosystem performance may require quasi-experimental or natural experimental designs. Through this systematic validation process, the descriptive propositions outlined here can evolve into empirically validated theoretical predictions, offering a robust foundation for both academic inquiry and practical ecosystem development strategies in emerging economies.

Recap of Main Findings

This study examined the interplay of institutional arrangements, stakeholder dynamics, and strategic collaborations shaping Malang Raya's digital innovation landscape. The analysis revealed that the ecosystem operates within a dual institutional framework, where formal institutions (government policies, regulations) and informal institutions (community networks, cultural values) interact to create a distinctive environment for digital innovation. Traditional values such as *gotong royong* have been adapted to support modern entrepreneurial practices. At the meso level, stakeholder interactions among government, universities, communities, industry, and media are characterized by varying degrees of power, legitimacy, and urgency, producing differentiated capacities for collaboration. At the micro level, a strategic collaboration model emerged that integrates formal institutional mechanisms, pentahelix stakeholder dynamics, and informal institutional elements, with six critical success factors, power, trust, readiness, resources, challenges, and opportunities, collectively determining the ecosystem's effectiveness in fostering startup development.

Interpretation of Key Findings

The findings extend North's (1990) institutional theory by illustrating how formal and informal institutions interact to shape startup outcomes. The observed gap between policy design and implementation reflects what Meyer and Rowan (1977) term "decoupling," where policies become ceremonial rather than operational, thereby constraining institutional effectiveness. This aligns with Scott's (2008) three-pillar framework, showing that regulative, normative, and cultural-cognitive elements jointly influence entrepreneurial behavior. Institutional performance varies spatially, consistent with Rodríguez-Pose's (2013) notion of "spatial stickiness," where central areas benefit from stronger institutional capacity than peripheral regions. Informal institutions, particularly community-led networking, often compensate for weak formal mechanisms, highlighting their adaptive and complementary roles. Stakeholder dynamics in Malang Raya's startup ecosystem are shaped by power, legitimacy, and urgency attributes (Mitchell et al., 1997), extending Freeman's (1984) stakeholder theory to regional innovation systems. Government actors hold central positions due to funding control and policy authority, creating power asymmetries that affect resource flows and collaboration patterns, as described in Rowley's (1997) network theory. Peripheral actors such as STASION exemplify how normative legitimacy (Suchman, 1995) can be built through consistent value delivery, bridging institutional gaps without formal authority. Conversely, media actors exhibit low salience across all attributes,

limiting their role in information dissemination and public engagement.

The strategic collaboration model, anchored in the “Three Dominant Pillars” of government, academia, and community, aligns with Etzkowitz and Zhou (2017) on the heightened role of these actors in regional contexts and extends Kriz et al. (2017) by operationalizing a framework that integrates formal institutions, stakeholder networks, and informal institutions. The six identified critical success factors refine Williamson’s (1985) transaction cost theory by specifying collaboration dimensions that determine efficiency in innovation ecosystems. This explains why structurally similar collaborative arrangements can yield divergent outcomes across regional contexts. Collectively, these insights advance institutional and stakeholder theories by revealing how co-evolutionary relationships among institutions and actors shape regional innovation outcomes. This conceptual contribution sets the foundation for translating the model into testable propositions, which are outlined in the Propositions subsection at the beginning of the Discussion, and for developing practical policy interventions that strengthen both formal and informal support mechanisms in non-metropolitan startup ecosystems.

Theoretical Implications

This study advances institutional theory by challenging North’s (1990) formal–informal dichotomy, demonstrating that innovation ecosystems benefit from institutional complementarity rather than substitution. The findings show that informal actors, such as STASION, adapt to formal voids by creating “intermediate institutions” (Khanna and Palepu, 2010) that lower transaction costs, reframing informal constraints as enabling mechanisms that enhance formal institutional performance. The “Three Dominant Pillars” framework extends Scott’s (2008) institutional pillars model by illustrating how normative and cultural-cognitive forces can offset regulatory weaknesses in emerging ecosystems. Moreover, the identification of institutional translation processes highlights dynamic adaptation, where community networks act as stabilizing forces during implementation gaps, shifting the perspective from deterministic to dialectical institutional change.

This reconfiguration also extends Mitchell et al.’s (1997) stakeholder salience model by showing that, within institutional voids, a dependent-stakeholder configuration, high urgency and normative legitimacy but limited formal power can itself anchor an ecosystem, rather than leaving such actors reliant on more powerful stakeholders as the original model anticipates. Stakeholders with low formal authority can gain prominence through urgency and consistent value delivery, introducing a “stakeholder ecology” where interdependencies outweigh dyadic relations and firm-centrism. This contests Rowley’s (1997) network centrality assumptions, showing that boundary-spanning activities and normative legitimacy can bridge “structural holes” (Burt, 1992). The strategic collaboration model integrates institutional theory, stakeholder theory, and regional innovation systems, aligning with Thornton et al.’s (2012) institutional logics yet extending it to capture regional innovation dynamics through a structuration lens, recognizing the co-constitution of actors and structures.

Conclusion

This research reveals a critical paradox at the heart of regional digital startup ecosystem

development: informal community organizations, despite lacking formal institutional authority or substantial resources, paradoxically become essential anchors for ecosystem sustainability and innovation. This study's primary theoretical contribution is to name and theorise this dynamic as paradoxical compensation: in resource-constrained regions, the very absence of formal power and pragmatic legitimacy becomes the condition under which community actors accrue the urgency and normative legitimacy needed to anchor the ecosystem. The case of Malang Raya's STASION community exemplifies this phenomenon, demonstrating how grassroots actors achieve transformative influence through normative legitimacy and cultural-embedded practices such as *gotong royong* (mutual cooperation). This paradox challenges conventional institutional theory, which assumes that formal authority and resource control determine stakeholder influence. Instead, this study reveals that in resource-constrained regional contexts, institutional voids create opportunities for community actors to become institutional entrepreneurs, translating national policies into locally grounded practices. Through the interplay of formal institutional mechanisms (government policies, regulatory frameworks) and informal institutions (community networks, cultural values, trust-based relationships), the study identifies a regional-adapted Pentahelix model featuring three dominant pillars, government, academia, and community with industry and media in supporting roles. This framework proves particularly effective in non-metropolitan contexts where resource optimization is essential. The research identifies six critical success factors, power dynamics, trust relationships, regional readiness, resource availability, challenge management, and opportunity exploitation that collectively determine ecosystem effectiveness and sustainability. These factors explain why structurally similar collaborative arrangements produce divergent outcomes across contexts. The findings demonstrate that successful ecosystem development requires both structured formal support systems and flexible, culturally-aligned collaborative mechanisms, creating a balanced approach that leverages local institutional strengths while maintaining alignment with national objectives.

Recommendations

This study offers several strategic directions for strengthening the sustainability and performance of Malang Raya's digital startup ecosystem. Future research should expand beyond a single-region focus by including comparative analyses with other Indonesian startup hubs, enabling a broader understanding of how institutional and stakeholder configurations vary across contexts. Longitudinal studies are essential to capture ecosystem evolution over time, particularly in response to technological changes and policy adjustments. For local stakeholders, developing robust trust-building mechanisms and standardized collaboration protocols will be crucial, while preserving flexibility for context-specific adaptations. Strengthening the Three Dominant Pillars model, community, academia, and government requires clearer role definitions and more effective integration with industry and media actors, whose contributions remain underutilized. The establishment of sector-specific incubators, especially in agritech and tourismtech, could harness Malang Raya's comparative advantages in agriculture and tourism. Policy implementation effectiveness can be improved through better coordination between national and local governance, regular stakeholder forums, and transparent allocation of resources. Ultimately, bridging the institutional translation gap between national policy design and local execution remains the most pressing priority. Success will depend on adopting context-sensitive

approaches that integrate cultural and institutional strengths, rather than replicating metropolitan innovation models, ensuring that ecosystem development aligns with both local identity and national objectives.

Future Empirical Research Agenda and Validation Framework

To build on the current findings and enhance generalizability, a structured empirical research agenda is proposed. First, comparative multi-case studies should examine 8–12 regional startup ecosystems across Southeast Asia that share similar institutional voids, including secondary cities such as Chiang Mai and Khon Kaen in Thailand, Penang and Johor Bahru in Malaysia, Cebu and Davao in the Philippines, and Da Nang and Can Tho in Vietnam. Following Yin’s (2018) replication logic, these studies would enable both literal and theoretical replication, strengthening the model’s external validity. Second, longitudinal research over a 5–7 year period should employ interrupted time series and panel data analysis to capture the co-evolution of institutional structures and stakeholder configurations. Third, mixed-methods validation, combining quantitative performance metrics with qualitative process tracing, would allow researchers to examine causal mechanisms behind institutional translation and stakeholder compensation dynamics. Fourth, cross-national quasi-experimental designs could test whether the Three Dominant Pillars configuration consistently emerges in resource-constrained contexts, using variations in national program support as a natural experimental condition. These designs should be complemented by large-scale surveys with target samples exceeding 200 ecosystems, employing standardized instruments to measure institutional complementarity, stakeholder salience asymmetry, and cultural–innovation integration. Finally, the adoption of digital network mapping would enable real-time monitoring of stakeholder interactions and resource flows, while action research collaborations with policymakers would facilitate the implementation and iterative refinement of framework-based interventions. This staged research pathway will help define boundary conditions, assess applicability across different sectors and maturity stages, and ensure the model can be adapted to diverse cultural and institutional environments throughout emerging Asian economies.

Practical Implications for Asian Business

The findings of this study offer actionable strategic guidance for policymakers and stakeholders engaged in fostering startup ecosystems within the Asian context. Moving beyond the idealized, balanced models often found in developed economies, this research proposes a “Regional-Adapted Pentahelix” framework that accounts for the specific institutional realities of secondary cities. A primary implication for policymakers is the need to move beyond rigid formal regulations by actively integrating informal institutional strengths. In many Asian contexts, such as Indonesia, cultural values like *gotong royong* (mutual cooperation) and robust community networks serve as the bedrock for collaboration (Sotarauta and Srinivas, 2006). Consequently, national initiatives such as the National 1000 Digital Startups Movement should avoid a one-size-fits-all, top-down approach. Instead, these programs must be translated into local contexts by formalizing the roles of regional stakeholders to bridge the gap in decentralized economies where center–periphery disparities remain persistent (Tödtling and Trippel, 2005). By empowering “anchor stakeholders”

specifically local government, academia, and community organizations, policymakers can ensure ecosystem stability even in the absence of massive metropolitan resources (North, 1990). The University as a Knowledge Anchor, closely linked to policy transformation is the evolving role of academia. In Asian regional hubs, universities must act as catalysts to bridge “structural holes” by embedding entrepreneurship education across disciplines and adopting more flexible Intellectual Property (IP) policies (Etzkowitz, 2003). As “definitive stakeholders” possessing high levels of legitimacy and power (Mitchell et al., 1997), elite regional universities should anchor the ecosystem by aligning their research agendas with the practical challenges faced by local startups through problem-based learning (Rasmussen and Sørheim, 2006). Within the “Three Dominant Pillars” framework, the university’s role extends beyond talent production; it serves as a critical surrogate for the industrial R&D infrastructure that is often lacking in secondary cities.

The relative scarcity of large-scale industry and media presence in regional areas often triggers a “stakeholder compensation mechanism,” where community groups are forced to fill institutional voids. To create a more vibrant and self-sustaining ecosystem, industry players must shift from short-term instrumental interests toward long-term engagement through structured mentorship and resource-sharing, echoing the principles of open innovation (Chesbrough, 2003). Simultaneously, media organizations should transition from episodic, event-based reporting to consistent innovation-focused storytelling. This shift is vital for building the “normative legitimacy” required to attract talent and investment to regional startup scenes (Zimmerman and Zeitz, 2002). The “Three Dominant Pillars” framework holds significant practical weight for other emerging Southeast Asian economies facing similar institutional challenges. Secondary cities such as Chiang Mai in Thailand, Penang in Malaysia, Cebu in the Philippines, and Da Nang in Vietnam all grapple with resource constraints and the need for community-mediated institutional translation. Policymakers in these nations can adapt this study’s findings by identifying their own salient informal institutions and positioning community actors as “ecosystem stabilizers” who harmonize formal mandates with grassroots realities (Cooke, 2016).

To conclude, regional stakeholders should establish formal governance bodies that explicitly integrate the three dominant pillars: government, academia, and community. Such coordination should be supported by shared digital platforms for ecosystem mapping and collaborative decision-making (Ansell and Gash, 2008). Lessons from second-tier innovation hubs in Thailand (Wonglimpiyarat, 2016) and Malaysia (Razak and White, 2015) suggest that stakeholder urgency and legitimacy are the true decisive factors for growth in decentralized settings. Ultimately, successful startup development in Asia depends on aligning regulatory frameworks with local cultural strengths, empowering regional actors, and fostering collaboration tailored to the unique socio-institutional landscape (Scott, 2008).

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