

# Systematic Review of Open Innovation Approaches for Industrialisation in Developing Economies

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## Abstract

Industrialisation remains a cornerstone of economic transformation in developing countries, yet progress is often constrained by fragmented innovation systems, resource limitations, and institutional barriers. Open innovation offers an alternative paradigm by promoting knowledge flows across organisational and sectoral boundaries. This systematic literature review critically examines how open innovation partnership models are conceptualised, implemented, and adapted to support industrialisation in low- and middle-income countries. The results demonstrate a progressive shift from linear innovation approaches to more networked, ecosystem-based configurations, with inbound, outbound, and coupled innovation strategies increasingly evident. University-industry-government (UIG) partnerships, intermediary-facilitated collaborations, and

digital platforms emerge as dominant mechanisms. SMEs are pivotal actors but encounter persistent capability and resource constraints. Key enablers include institutional trust, leadership commitment, absorptive capacity, and digital infrastructure. Conversely, barriers such as weak policy coherence, infrastructural deficits, and fragmented coordination inhibit innovation outcomes. The analysis also identifies emerging trajectories, notably the integration of AI and digital technologies in innovation ecosystems and the evolving role of intermediaries. This review highlights critical research gaps, particularly the need for empirically validated frameworks and SME-centric strategies and offers insights to inform policy design and the development of inclusive, adaptive innovation systems aligned with sustainable industrialisation objectives.

**Keywords:** open innovation; industrialization; developing countries; innovation partnerships; SMEs; innovation ecosystems; digital transformation; systematic literature review; Triple Helix; innovation policy

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## Introduction

Industrialisation is an important strategy for fostering long-term economic development in underdeveloped countries. In the midst of global transformations in production dynamics and technological advances, open innovation has emerged as a strategic model with the potential to reshape how nations in the Global South seek industrial success. Rather than depending primarily on internal R&D, the open innovation paradigm encourages organisations to work beyond institutional boundaries, leveraging external ideas, technologies, and capabilities to co-create value and accelerate advancement. Open innovation fundamentally undermines the notion of closed, private innovation processes. It promotes the creation of inclusive ecosystems in which government, industry, academia, and civil society actively participate in mutual knowledge exchange and issue solutions. This paradigm is particularly well suited to the needs of developing nations, where resource restrictions and fragmented innovation systems frequently impede technological growth. This systematic review investigates the relationship between open innovation and industrialisation in low- and middle-income countries, specifically how partnership-driven innovation strategies might stimulate structural transformation. It draws on a wide range of literature to evaluate theoretical models, practical frameworks, and empirical evidence on the adoption, benefits, and restrictions of open innovation in different settings. This study is based on the idea that successful industrialisation is no longer simply about increasing output but also about developing innovation capacity through dynamic networks and shared capabilities.

The primary goal of this review is to investigate how open innovation partnership models contribute to industrial development in developing countries. To accomplish this, the paper analyses the theoretical foundations of open innovation and evaluates their relevance to industrial policy in resource-constrained contexts. It categorises and critically examines key open innovation practices and partnership models relevant to the Global South, with an emphasis on inbound, outbound, and coupled approaches. The review presents insights on the evolution of partnership approaches, stakeholder roles, enabling factors, and barriers to effective collaboration, with particular attention to the role of small and medium-sized enterprises (SMEs). It also explores the integration of digital technologies and the strategic function of intermediaries in contributing to innovation ecosystems. The study synthesises emerging trends and identifies gaps in empirical evidence, SME-specific frameworks, and innovation measurement. Finally, the review aims to provide actionable policy insights and strategic recommendations to support inclusive and sustainable industrial transformation through dynamic and networked innovation systems.

## Methodology

### *Literature search and selection*

This study uses a systematic literature review (SLR) technique to conduct a thorough and transparent analysis of scholarly work on open innovation and industrialisation in poor countries. The review uses specific search phrases such as “open innovation,” “industrialisation,” “developing countries,” “innovation systems,” and “SMEs” to locate publications in major academic databases such as Scopus, Web of Science, Google Scholar, and ScienceDirect. To ensure quality and relevance, only peer-reviewed journal articles, conference papers, and policy reports from 2000 to 2024 were evaluated. The literature was thematically coded to find repeating patterns, categorise open innovation approaches, and connect them to conceptual models like the Triple Helix, Innovation Systems Theory, and Resource-Based View. The review also highlights gaps in the research and draws conclusions that are directly relevant to policy and practice in developing nations.

The initial search identified approximately 1000 documents spanning journal articles, conference papers, and policy reports. Studies were screened in three stages: title review, abstract review, and full-text assessment. Inclusion criteria focused on studies that addressed open innovation models, practices, or partnerships with direct relevance to industrialisation in developing countries. Exclusion criteria included studies focused solely on advanced economies, those lacking a theoretical or empirical contribution, and publications not available in English. Following this process, 112 high-relevance sources were selected for in-depth analysis (See Appendix A). The final set reflects a diverse body of literature encompassing theoretical frameworks, empirical studies, and policy-focused analyses.

### *Open innovation impact mechanisms analysis*

The selected studies were analysed using a thematic synthesis approach to identify key mechanisms through which open innovation contributes to industrialisation in developing contexts. The literature was coded iteratively to extract patterns related to innovation partnership models, actor roles, enabling factors, barriers, and policy implications. Special attention was given to the mechanisms by which knowledge flows are facilitated across organisational and sectoral boundaries, and how these processes impact SME participation, innovation performance, and ecosystem development. The analysis also examined the role of intermediaries, digital platforms, and emerging technologies in shaping open innovation outcomes.

Mechanisms were identified through an inductive thematic coding process. After full-text review of the selected studies, key concepts and recurring themes

related to open innovation practices and their role in industrialisation were systematically extracted and categorised. An initial set of thematic codes was developed based on established conceptual models such as the Triple Helix, Innovation Systems Theory, and the Resource-Based View. Additional codes were added iteratively to capture emerging themes from the literature, including digital transformation, intermediary roles, and SME-specific dynamics. Cross-comparison of coded material allowed for the identification of mechanisms that facilitate or hinder knowledge flows, collaborative innovation, and industrial upgrading. The resulting synthesis informed the structure of the Results and Policy Recommendations sections of this review.

## Conceptual and Theoretical Foundations

### *Definition of open innovation*

The concept of open innovation represents a transition from the old model of closed, internalised research and development (R&D) to a more outward-looking, collaborative approach to innovation. Open innovation, first coined by Henry Chesbrough, is defined as the strategic utilisation of both internal capabilities and external knowledge flows to improve innovation processes (Chesbrough, 2003). It reflects an awareness that significant insights, ideas, and technological breakthroughs frequently exist outside of a single organization's borders and that enterprises can gain a competitive advantage by harnessing this external knowledge through purposeful collaboration.

In practice, the use of OI involves forming dynamic relationships with a wide range of stakeholders, including customers, suppliers, startups, institutions, and even competitors. Such partnerships, based on joint value creation, are formed with the aim of finding solutions, accelerating product development, and gaining access to new knowledge, skills, and technologies. Companies that implement OI create more flexible, adaptive innovation ecosystems, which is especially important in rapidly changing and resource-constrained contexts. This involves moving away from the principle of closed innovation and promotes adaptability, co-creation, and ecosystem thinking.

The OI model encourages companies to create open systems in which ideas and technologies can “flow in” and “flow out,” blurring their boundaries. This allows companies to attract a wider range of partners, including customers, research institutions, other companies, and even competitors, which accelerates problem solving and expands access to markets. Three modes are commonly used to classify OI: inbound, outbound, and combined. “Inbound OI” refers to the acquisition of external ideas and technologies and their integration into a company's own innovation activities. This activity often takes the form of

technology scouting, licensing, or joint development (Saebi, Foss, 2015). In turn, “outgoing OI” refers to the transfer (including on a commercial basis) of innovations created by the company to external partners in order to enhance their effect or obtain new sources of income (Michelino et al., 2014). The combined mode combines the two above: sharing existing innovation results and creating new ones jointly with partners. By leveraging skills distributed across the innovation landscape, this network approach enables companies, especially in developing countries, to overcome resource constraints and accelerate industrial and technological modernization. For a detailed overview of each mode of IP creation, see Table 1.

### *Theoretical perspectives*

An underlying basis in an array of linked theoretical frameworks that describe how innovation arises, spreads, and boosts competitiveness is necessary for understanding open innovation in the setting of developing nations. This review is based on three prominent viewpoints: the Resource-Based View (RBV), the Triple Helix Model, and Innovation Systems Theory.

*Innovation System Theory.* According to the Innovation Systems Theory, innovation results from interactions between a variety of players within a larger institutional and policy framework, including businesses, research institutes, governmental entities, and intermediaries (Watkins, 2015). This idea emphasises how innovation is a systemic process that is influenced by infrastructure, financial mechanisms, education systems, and legislation rather than being a linear or firm-centric process. Innovation systems can be sectoral, technological, national, or regional, and they work best when information is openly shared among participants, encouraging experimentation, dissemination, and adaptation.

*Triple Helix of University-industry-government relations.* The Triple Helix Model, which emphasises the changing dynamics between government, business, and academics (Etzkowitz, Leydesdorff, 2000), is a useful addition to this systems concept. According to the concept, ongoing, co-evolutionary cooperation across these three domains increases the likelihood of sustained innovation outputs. In developing nations, where fragmented innovation ecosystems and institutional silos are prevalent, the Triple Helix provides a framework for knowledge co-production, resource sharing, and gap-closing. It also emphasises how crucial it is to establish hybrid organisations that are at the nexus of these three fields, like university incubators or public-private Research and Development platforms.

*Resource-Based View.* Providing an internal perspective, the Resource-Based View (RBV) asserts that businesses can obtain a competitive edge by creating and using special resources and talents that are valu-

Table 1. Practices of Open Innovation, by type

Practice	Summary Definition
<i>Outside-In</i>	
Licensing-In	Acquiring IP or tech rights from external entities
Customer Involvement	Engaging customers in product or process innovation
Consulting	Using external experts to solve innovation challenges
Technology Scouting	Searching for emerging external technologies
Outsourcing (Contract R&D)	Delegating R&D or innovation tasks to external firms
Crowdsourcing	Seeking ideas or solutions from an open online community
Reverse Engineering	Extracting insights from competitors' products
Sharing Facilities	Using or co-locating infrastructure with external partners
<i>Inside-Out</i>	
Licensing-Out	Selling or leasing internal IP to external firms
Spin-Off	Creating a new company using internal knowledge or assets
Open Source	Sharing internal tech openly for indirect strategic gains
Divesting	Selling internal units or technologies
<i>Coupled</i>	
Joint Research	Collaborative R&D with academia or other firms
Joint Development	Co-creating innovations with external partners
Joint Manufacturing	Sharing production of goods or services
External Participation	Attending fairs, consortiums, or conferences for knowledge exchange

Source: adapted from (Candi, Kahn, 2025).

able, rare, inimitable, and non-substitutable (VRIN) (Talaja, 2012). RBV aids in the explanation of why certain businesses are more suited to gain from co-operative agreements in the context of open innovation. These businesses usually possess the strategic vision to match alliances with core strengths as well as the absorptive capacity, or the ability to recognise, absorb, and utilise outside information for competitive advantage.

Significance of industrialization in developing countries

Industrialisation has historically been a cornerstone of national growth, allowing governments to diversify their economies, increase productivity, and create jobs. For developing countries, industrial transformation is frequently considered as a crucial step towards long-term economic growth and higher living standards. Industrial sectors, particularly manufacturing, can absorb surplus labour from agriculture, boost export profits, and catalyse technical advancement. Despite its significance, industrialisation has not always followed the conventional, linear path observed in previously industrialised states in many low- and middle-income countries (Araujo et al., 2021). Manufacturing is a crucial step in the development and industrialization process, however some patterns indicate that some nations are eschewing industrialisation entirely and instead transitioning straight from agricultural into low-productivity service industries a process known as “premature deindustrialisation.” (Rodrik, 2016).

For example, the issues in sub-Saharan Africa are complex. Industrial expansion has been hampered by a combination of structural constraints, poor institutions, inadequate infrastructure, and a lack of skilled labour. However, new data suggests that the industry is reviving, especially through micro and small-scale manufacturing businesses (Edobor, Sambo-Magaji, 2025), this research demonstrates how exchange rate policies, human capital, and geographical differences affect industrial success in African countries. Others have also emphasised how crucial it is to combine industrial strategy with more comprehensive innovation and employment plans, especially in economies with young populations and significant levels of informality. Developing nations have both possibilities and challenges because of the global fall in manufacturing’s GDP share, the advent of automation, and changing global trade patterns. New models that integrate industrialisation with innovation, digital transformation, and inclusive growth are becoming more popular, even though classic export-led industrialisation may no longer ensure widespread prosperity (Delechat et al., 2024). Therefore, industrialisation is still relevant, but it needs to be rethought to consider the changing dynamics of the twenty-first century.

Rationale for Open Innovation in Industrialization

In developing nations, with their limited internal resources and fragmented innovation ecosystems, open innovation is best understood as a systematic strategy that brings together a variety of actors, including startups, government agencies, academic in-



stitutions, and businesses, to work together towards common industrial goals (Ogink et al., 2023; Rabelo et al., 2015). Several enablers are necessary for effective implementation, including building internal capacity to learn and apply new information, creating transparent intellectual property frameworks, collaborating to share operational and financial risks, and incorporating feedback loops for ongoing learning and adaptation (Santos, 2024). Monitoring important parameters including partnership activity, time-to-market, and information flow helps improve innovation success. Leadership that encourages a culture of transparency, experimentation, and mutual value creation is essential to this process. Open innovation transforms from a collection of methods into a comprehensive development approach that synchronises innovation with the objectives of sustainable and inclusive industrialization (Ghobakhloo et al., 2021).

By filling in important gaps in resources, competencies, and market responsiveness, open innovation provides a measured method for reviving industrialisation initiatives in poor nations (Anshari, Almunawar, 2022). Open innovation promotes businesses to work with external partners, including startups, universities, and other industries, to co-develop solutions, share risks, and access complementary skills (Berchicci, 2013). The collaborative concept has several benefits. First, it makes specialised expertise and technologies more accessible, which enables businesses especially SMEs to get beyond internal barriers and quicken innovation cycles. Second, it makes innovation more financially feasible by sharing costs across partners, which lessens the financial strain of R&D. Third, by allowing businesses to use pre-existing technology or co-develop solutions with knowledgeable partners, open innovation reduces time-to-market (Lee et al., 2010). Open innovation strengthens supply chains, promotes cross-sectoral learning, and increases overall industrial resilience by integrating businesses into larger innovation ecosystems. This flexibility is essential in marketplaces that are changing quickly (Smith, 2007). Together, our capacity for innovation, learning, and adaptation puts businesses and the industries they serve in a better position to react to changing technological trends and economic conditions (Dolata, 2009).

Thus, open innovation is essential for developing nations hoping to industrialise under challenging and resource-constrained circumstances. It offers a structure for cooperation, testing, and ecosystem building that fits the requirements of sustainable and equitable industrial growth (Oliveira-Duarte et al., 2021).

### **Conceptualising Open Innovation process in developing countries**

In developing countries, open innovation can be institutionalised within a larger national development strategy, as shown by the conceptual model (Figure 1). The National Development Agenda, the

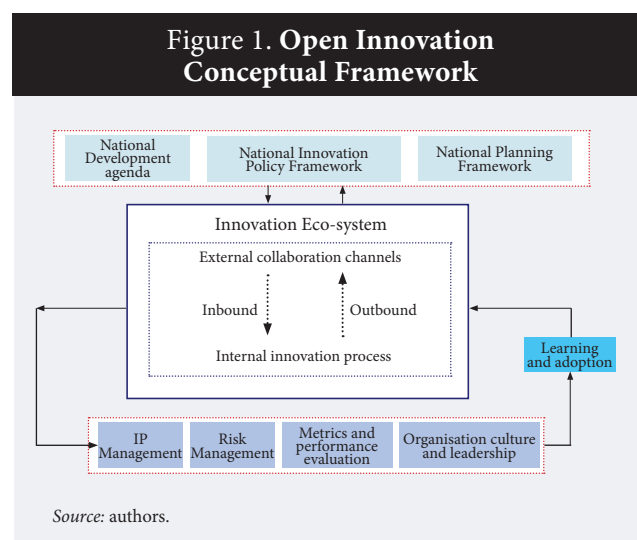
National Innovation Policy Framework, and the National Planning Framework serve as the model's three main policy pillars. These frameworks offer the strategic direction and legal underpinnings for innovation-driven industrialisation. The Innovation Ecosystem, which promotes an ongoing flow of concepts, technologies, and skills via external channels of collaboration, is at the heart of the paradigm. These channels provide both outbound flows, where internal ideas are disseminated or commercialised externally, and inbound flows, where external technology and knowledge are incorporated into internal innovation operations.

Four operational enablers underpin this ecosystem: IP management, which controls knowledge ownership and transfer; risk management, which reduces uncertainty and resource constraints; metrics and performance evaluation, which gauges the efficacy of innovation; and organisational culture and leadership, which promote transparency, flexibility, and teamwork within businesses. The Learning and Adoption loop, a key component of the framework, makes sure that input from innovation initiatives guides the improvement of policies and the building of capacity. These interrelated elements work together to provide a strong, flexible framework that supports inclusive and sustainable industrial transformation by coordinating institutional capacities with national development objectives.

## **Results of Thematic Synthesis**

Building on the mechanism analysis described previously, the findings are organised around key patterns and mechanisms through which open innovation partnerships are shaping industrialisation processes in developing countries. The results highlight the evolution of partnership models, stakeholder roles, enabling factors, barriers, and emerging trends that influence the development of dynamic innovation ecosystems.

**Figure 1. Open Innovation Conceptual Framework**



Descriptive Characteristics of the Reviewed Studies

This subsection provides an overview of the descriptive characteristics of the reviewed studies, including publication trends, geographical distribution, methodological approaches, industrial sectors covered, and theoretical foundations.

*Temporal Distribution of Publications.* The reviewed literature shows a clear increase in scholarly attention to open innovation and its role in industrialisation in developing countries over the past two decades. Early publications in this area were limited and fragmented, with only a small number of conceptual and policy-oriented papers appearing prior to 2010. From approximately 2015 onwards, there has been a marked growth in both the volume and diversity of publications, reflecting the increasing relevance of open innovation frameworks in development policy and practice. This growth corresponds with broader global shifts toward innovation-driven development agendas and digital transformation initiatives. The upward trend is particularly evident in the last five years (2019–2024), where a surge of empirical studies, systematic reviews, and analyses of innovation ecosystems has emerged. This indicates that open innovation has moved from a niche topic to a recognised area of inquiry within the field of industrialisation in developing contexts. This upward trajectory in publication activity provides a rich and evolving evidence base for the subsequent thematic synthesis presented in this review. Refer to figure 2.

*Geographical Distribution.* The geographical distribution of the reviewed literature shows that African contexts are the most extensively studied, reflecting both the growing interest of scholars and policy actors in leveraging open innovation to address industrialisation challenges across the continent. Studies focusing

on African countries account for the largest share of the reviewed sample, with notable contributions covering Sub-Saharan Africa and country-level analyses from South Africa, Nigeria, Kenya, and other nations. Asia is also represented, though to a lesser extent, with studies covering emerging economies such as China, India, and selected Southeast Asian countries. European-based scholars contribute to the literature primarily through conceptual and comparative studies, often in collaboration with researchers and institutions in developing regions. South America appears less frequently in the reviewed literature, with some studies addressing Brazil, Mexico, and cross-regional innovation networks. This uneven distribution highlights both opportunities and challenges for building a comprehensive understanding of open innovation partnerships in diverse industrial contexts. The predominance of studies from low to middle-income countries suggests that open innovation is more advanced in contexts with relatively stronger innovation systems and institutional capacity. The synthesis that follows therefore draws attention to both common patterns across regions and context-specific variations that reflect differing stages of industrial development. Refer to figure 3.

*Types of Studies and Methodological Approaches.* The reviewed literature encompasses a wide range of study types and methodological approaches, reflecting the multidisciplinary nature of research on open innovation and industrialisation. Conceptual and literature-based studies represent approximately 38% of the total sample, including theoretical frameworks, conceptual syntheses, and normative policy proposals. Systematic literature reviews (SLRs) and bibliometric analyses account for roughly 21%, providing structured insights into the evolution of open innovation scholarship. Empirical research forms a significant portion of the evidence base at 28%. Quantitative studies, primarily surveys employing structural equation modelling (SEM), regression analyses, canonical correlation, and other statistical techniques constitute about 3.6%, with a strong focus on SME adoption of open innovation practices. Qualitative approaches, including case studies, thematic analyses, and policy evaluations, represent approximately 10% and contribute rich contextual insights. A smaller subset of studies 1% employs econometric modelling and network analysis to explore macro-level patterns in innovation ecosystems. The methodological diversity observed here enhances the robustness of the evidence base but also reveals certain limitations. While survey-based and conceptual research are dominant, there is a relative scarcity of longitudinal studies and in-depth qualitative research that can capture the dynamic and context-specific nature of open innovation partnerships. The findings from this varied body of work provide a strong foundation for the thematic synthesis presented in the subsequent sections. Refer to figure 4.

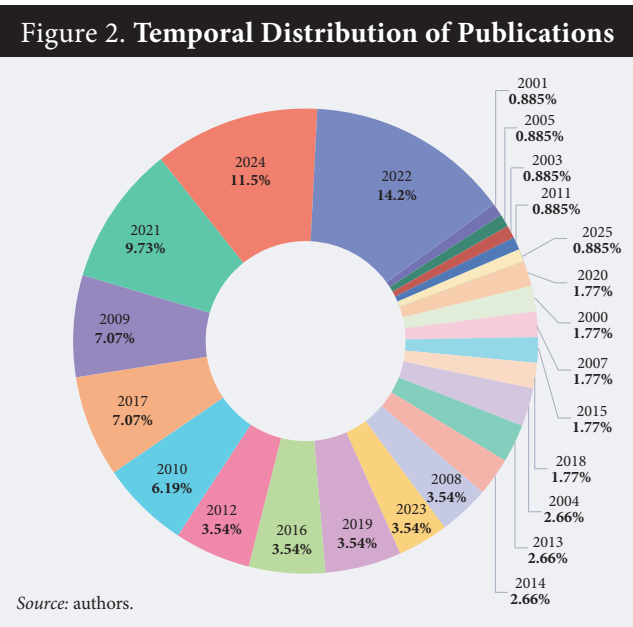
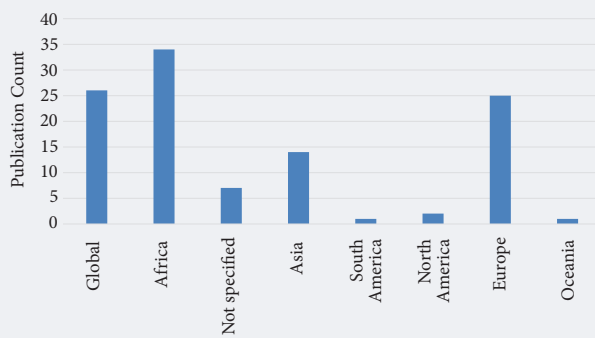
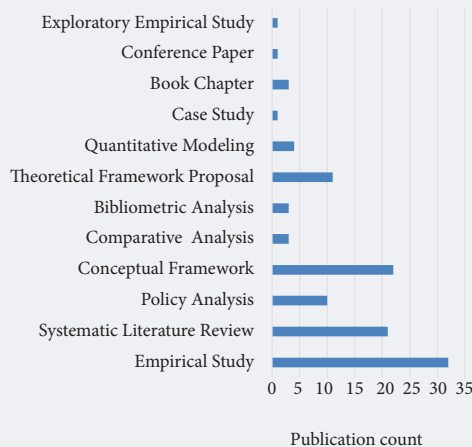


Figure 3. Geographical Distribution



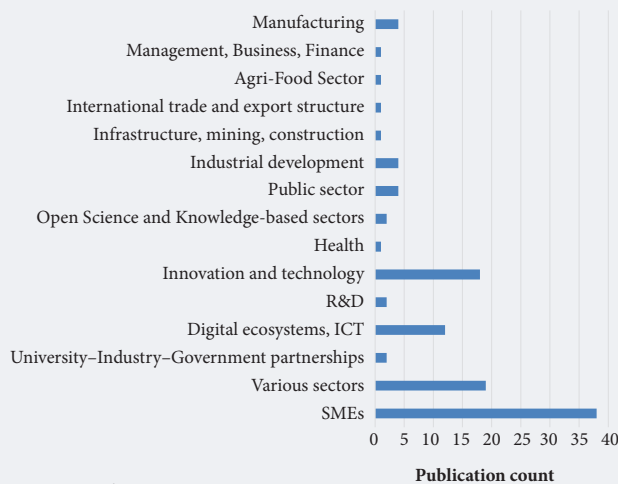
Source: authors.

Figure 4. Types of Studies and Methodological Approaches



Source: authors.

Figure 5. Industrial Sectors Covered



Source: authors.

*Industrial sectors covered.* A large proportion of the reviewed literature focuses on open innovation practices among small and medium-sized enterprises (SMEs), often across multiple sectors. Studies addressing open innovation in SMEs represent approximately 34.5% of the sample, frequently exploring cross-sectoral dynamics and the role of SMEs as innovation adopters and ecosystem participants. As such, many papers do not explicitly focus on one industrial sector but instead examine innovation behaviours, partnership models, and policy frameworks applicable to SMEs operating across diverse economic activities. Where sectoral focus is evident, manufacturing remains the most studied industry, reflecting its traditional role in industrialisation. Approximately 4% of studies address manufacturing, including both high-tech and low-tech subsectors. The agri-food sector features in a smaller subset of studies (1%), often linked to rural development and SME innovation in value chains. The ICT and digital services sector is also represented (11%), particularly in relation to digital platforms and knowledge exchange. Overall, the sectoral distribution highlights the prominence of SME-focused and cross-sectoral studies, with relatively limited coverage of sector-specific innovation dynamics in industries such as healthcare, energy, and construction. This pattern reflects both the research emphasis on SMEs as key actors in developing country innovation ecosystems and the cross-cutting nature of many open innovation initiatives. Refer to figure 5.

*Theoretical Basis.* The reviewed literature draws upon a wide range of theoretical frameworks to examine open innovation and its relationship to industrialisation in developing countries. The most used perspectives are those associated with open innovation models and related business frameworks, which appear in approximately 50% of the studies. These include the Open Innovation Framework, co-creation models, and business model innovation, particularly in the context of SME development. Innovation Systems Theory, including National Innovation Systems (NIS) and Sectoral/Regional Innovation Systems, is another prominent foundation ([20%], often used to analyse the structural and institutional factors shaping innovation ecosystems. Dynamic Capabilities and Resource-Based View (RBV) perspectives are applied in 15% of the studies, particularly those examining how firms develop strategic capabilities to engage in open innovation partnerships. The Triple Helix Model and related ecosystem-based approaches appear in 10%, highlighting the role of university-industry-government interactions in fostering collaborative innovation. Smaller but growing subset of studies (5%) incorporates frameworks from technology adoption, digital economy theories, and economic complexity perspectives to explore how digital transformation is reshaping innovation dynamics. The diverse theoretic-



cal base reflects the multidisciplinary nature of the field but also points to opportunities for greater theoretical integration. While many studies adopt single-framework approaches, there is a need for more holistic models that can better capture the complex, multi-actor nature of open innovation partnerships in developing contexts.

**Focus Area.** The reviewed studies address a range of focus areas related to the adoption and impact of open innovation in developing countries. The most prominent area of focus is open innovation in SMEs, which accounts for approximately 30% of the sample. These studies explore how SMEs adopt and implement open innovation practices, the barriers they face, and the enabling factors that influence their participation in innovation ecosystems. This strong emphasis reflects the central role that SMEs play in the industrialisation processes of many developing economies. University-industry-government (UIG) partnerships represent another key focus area (25%), with studies examining the dynamics of collaboration between academic institutions, firms, and public sector actors. Innovation policy and systems-oriented research (20%) addresses how national and regional innovation frameworks can support open innovation and industrial upgrading. Technology and digital transformation is a rapidly growing focus area (15%), with studies highlighting the role of digital platforms, ICT tools, and Industry 4.0 technologies in facilitating open innovation practices. Research on innovation ecosystems and collaboration (5%) examines how multi-actor networks, intermediaries, and collaborative platforms shape innovation outcomes. Inbound and international open innovation is a smaller but emerging area (5%), focusing on knowledge sourcing and cross-border collaboration by firms in developing contexts. The dominance of SME-focused and cross-sectoral studies, alongside increasing attention to digitalisation and ecosystem collaboration, reflects both current policy priorities and practical challenges in fostering innovation-driven industrialisation.

### ***Changes in partnership approaches***

The reviewed literature highlights significant changes in how open innovation partnerships are structured and operationalised in developing contexts. Early studies focused predominantly on formal university-industry-government (UIG) collaborations and public-private partnerships, often driven by donor funding and government policy initiatives. Donor-driven models, while instrumental in catalysing early innovation partnerships, have sometimes resulted in fragmented or short-term initiatives that struggle with long-term sustainability and local ownership, 90% of the papers reviewed do not recommend these models. Over time, there has been a notable shift toward more diverse and flexible partnership models.

Informal collaborations and intermediated networks such as innovation hubs, incubators, and living labs are increasingly prevalent, enabling more agile forms of knowledge exchange and co-creation.

Cross-sectoral and multi-stakeholder approaches now feature prominently, with horizontal and vertical alliances involving actors from the private sector, academia, government, civil society, and international partners. This reflects a growing recognition that open innovation requires ecosystem-wide engagement, particularly in resource-constrained settings. International and cross-border collaborations are also gaining traction, enabling firms and innovation networks in developing countries to access global knowledge flows and market opportunities. Digital platforms and ecosystem-based collaborations represent a further evolution, facilitating distributed innovation and crowd-based engagement. These developments indicate a move away from linear and centrally coordinated partnership models toward more dynamic, networked approaches that are better suited to the complexities of industrialisation in the Global South.

### ***Models of Open Innovation Partnerships***

The reviewed literature reveals a wide variety of models and typologies used to conceptualise and structure open innovation partnerships in developing countries. At the national and regional level, National Innovation Systems (NIS) and Regional Innovation Systems (RIS) remain foundational frameworks, providing a systemic view of how innovation capabilities are built across institutional actors. These models are particularly useful for identifying gaps in policy coherence and institutional capacity in developing contexts. Open innovation-specific models such as inbound, outbound, and coupled innovation frameworks are widely applied at the firm and network level. Several studies also propose integrative models that combine innovation processes with business model innovation and ecosystem thinking, recognising the dynamic and distributed nature of innovation in resource-constrained environments. The Triple Helix and its extended versions (Quadruple and Quintuple Helix) feature prominently, reflecting the centrality of university-industry-government collaboration and the increasing inclusion of civil society and environmental considerations in innovation partnerships.

These models are frequently used to analyse both formal and informal collaboration mechanisms and the evolving roles of different actors in innovation ecosystems. Ecosystem and network-based models, including Living Labs, intermediated networks, and platform-based collaborations, are increasingly visible in recent studies. These models emphasise flexibility, user-centred innovation, and the role of intermediaries in orchestrating cross-sectoral collaboration. Dynamic capabilities frameworks are also



employed to explain how firms particularly SMEs, develop the capacity to engage effectively in open innovation partnerships. The literature demonstrates a rich but fragmented landscape of models, with considerable variation in how they are operationalised across contexts. While existing models provide valuable conceptual tools, there is a growing need for more context-sensitive and integrated frameworks that better reflect the complex, multi-actor realities of open innovation in developing countries.

### ***Key actors and stakeholder roles***

The literature consistently highlights the multi-actor nature of open innovation ecosystems in developing countries, with distinct roles played by government, academia, private firms, civil society, intermediaries, and SMEs. Government actors are typically positioned as key enablers, providing the policy frameworks, infrastructure, and financial support needed to foster innovation. Governments also play an increasingly proactive role in facilitating innovation ecosystems through the creation of incubators, digital infrastructure, and incentives for cross-sectoral collaboration. Academic and research institutions serve as critical generators of knowledge, though their engagement with industry remains uneven across contexts. Universities and research centres contribute to skills development, knowledge creation, and collaborative research, but often face institutional and cultural barriers that limit their participation in dynamic innovation partnerships.

Private sector firms, particularly large enterprises and multinational corporations, focus primarily on the commercialisation and scaling of innovations. They contribute essential resources, market access, and technological capabilities to innovation ecosystems. SMEs, meanwhile, are central actors in the open innovation landscape. They are both adopters and implementers of open innovation practices, often benefiting from intermediary facilitation and partnerships with larger firms, academia, and government actors. However, SMEs face significant barriers related to absorptive capacity, access to finance, and limited resources. Civil society actors and intermediaries play increasingly important roles in bridging institutional gaps, facilitating trust-building, and supporting user-centred innovation. Intermediaries such as innovation hubs, incubators, and network brokers enable knowledge flows and help orchestrate collaboration across fragmented ecosystems.

### ***Enablers of Effective Open Innovation Partnerships***

Trust and social capital emerge as foundational enablers of effective open innovation partnerships. The literature highlights the importance of trust-based networks, transparent intellectual property (IP) regimes, shared goals, and informal interactions in fa-

cilitating knowledge exchange and collaborative innovation. In contexts where formal institutions may be weak, relational trust is often the glue that holds innovation partnerships together.

Leadership and strategic alignment within organisations also play a critical role. Strong top management support, a clear strategic vision for innovation, and cultural alignment with open innovation principles are consistently associated with more successful partnerships. Organisational leadership that fosters a learning orientation and openness to external collaboration is particularly important for SMEs engaging in innovation ecosystems. Digital infrastructure and readiness are increasingly recognised as essential enablers. Access to ICT tools, digital platforms, and interoperable systems facilitates distributed innovation and enables SMEs and other actors to participate more fully in innovation networks. Digital inclusion policies and investments in ICT capacity building are seen as critical to levelling the playing field for smaller and less-resourced actors.

A supportive policy and institutional environment is another key enabler. Effective policies, infrastructure investment, access to finance, and skilled labour development all contribute to the strength of national and regional innovation ecosystems. The alignment of policy frameworks with local contexts and the promotion of cross-institutional trust are particularly important in resource-constrained settings. At the organisational level, dynamic capabilities such as absorptive capacity, learning orientation, and the ability to integrate external knowledge are central to successful open innovation engagement. Networks, ecosystems, and intermediary organisations also play a vital enabling role by facilitating interactions, building social capital, and providing access to knowledge, resources, and markets.

### ***Barriers and Challenges***

Institutional and policy weaknesses are among the most pervasive barriers to open innovation partnerships. Inadequate infrastructure, underfunded innovation systems, low levels of skills development, and fragmented or incoherent policy frameworks frequently undermine the effectiveness of innovation ecosystems. Weak enforcement of intellectual property (IP) rights and limited absorptive capacity within institutions further constrain knowledge flows and collaboration. Infrastructure and resource constraints are a recurring theme, particularly for SMEs and less-resourced actors. Limited access to finance, inadequate digital infrastructure, and high costs associated with IP protection and advanced technologies create substantial barriers to participation in open innovation ecosystems.

Cultural and organisational resistance also poses significant challenges. Many organisations especially in

contexts with limited prior experience of open innovation exhibit cultural inertia, a lack of absorptive capacity, and internal resistance to knowledge sharing. Over-reliance on internal incentives and leadership gaps further inhibit the adoption of open innovation practices. Knowledge and capability gaps represent another critical constraint. Many firms lack the dynamic capabilities needed to engage effectively in open innovation partnerships.

Fragmentation and coordination issues across ecosystems further inhibit collaboration. Siloed departments, fragmented support structures, and power imbalances among actors often result in inefficient or unsustainable partnerships. A lack of trust and unclear value distribution between actors can exacerbate these problems. Finally, legal, IP, and data barriers complicate knowledge sharing and collaboration. Legal uncertainties, high costs of technology adoption, concerns over data privacy, and poorly harmonised regulatory frameworks hinder both domestic and cross-border innovation partnerships.

### ***Thematic Synthesis of Literature***

A multidimensional view of innovation systems and contextualisation emerges strongly from the literature. Effective open innovation partnerships in developing contexts require tailoring to local institutional, cultural, and market conditions. Informal and formal linkages, as well as hybrid innovation models, are particularly important in fragmented innovation ecosystems. There is a clear need for integrated and context-sensitive innovation systems that align with national development priorities and industrial strategies. Open innovation and collaboration represent a core mechanism for fostering industrialisation. The literature documents a clear shift from closed innovation models to more open, collaborative approaches that leverage external knowledge flows. Business model innovation and co-creation strategies are increasingly used to enable SMEs and other actors to participate in innovation ecosystems and drive value creation.

Digital transformation and infrastructure are rapidly reshaping innovation dynamics. Digital platforms, ICT tools, and open digital ecosystems enable more inclusive participation in innovation partnerships and facilitate knowledge exchange across traditional sectoral and geographic boundaries. However, disparities in digital readiness remain a critical constraint. Dynamic capabilities and organisational learning are essential enablers of effective open innovation. Firms that develop strong absorptive capacity, strategic agility, and learning orientation are better positioned to leverage external knowledge and collaborate effectively. Organisational enablers must be supported by ecosystem-level interventions to enhance these capabilities across the innovation system.

Policy and institutional support is widely recognised as a critical success factor. Tailored innovation policies, intermediary organisations, and cross-sectoral collaboration platforms are needed to foster sustainable open innovation partnerships. Policy coherence, stakeholder alignment, and adaptive governance are especially important in dynamic and resource-constrained contexts. Finally, intermediaries and networks play a pivotal role in making open innovation viable in developing countries. Intermediaries facilitate trust-building, knowledge flows, and cross-sectoral collaboration. Strong network ties and multi-level innovation networks are key to overcoming fragmentation and enabling the emergence of more resilient and inclusive innovation ecosystems.

### **Future Research Avenues**

Despite significant progress in the literature on open innovation and industrialisation in developing countries, important gaps remain in research, policy, and practice. Building on the thematic synthesis of the reviewed literature, this section identifies key gaps and emerging issues that define future research priorities in the field of open innovation and industrialisation in developing countries.

#### ***Gaps in research, policy and practice***

A major gap in the literature relates to empirical validation and the long-term impact of open innovation partnerships. Many studies remain conceptual or cross-sectional; few provide robust empirical evidence on how different partnership models affect industrial upgrading over time. There is a clear need for longitudinal studies, comparative analyses, and mixed-methods research that can capture the dynamic and evolving nature of innovation ecosystems in developing contexts. SME-specific gaps are particularly prominent. While SMEs are central actors in open innovation ecosystems, there is a lack of SME-specific frameworks, toolkits, and metrics tailored to the unique constraints and opportunities they face in low- and middle-income countries. The development of practical, scalable models to support SME engagement in open innovation remains a priority for both research and policy.

Policy and institutional gaps also persist. Many national innovation strategies do not adequately incorporate open innovation principles or support ecosystem development. There is limited understanding of how intermediary organisations can be effectively leveraged within policy frameworks, and a need for more context-specific, adaptive policy instruments aligned with local innovation dynamics. Measurement and indicators represent another critical gap. Current innovation metrics are often poorly harmonised, insufficiently granular, or fail to capture key di-

mensions of open innovation such as absorptive capacity, network dynamics, and cross-sectoral knowledge flows. Developing better indicators is essential for both academic analysis and policy evaluation.

Sectoral and regional gaps are evident as well. Much of the existing literature focuses on middle-income countries and a limited set of sectors (primarily manufacturing and ICT). More research is needed on open innovation in under-researched sectors (e.g. healthcare, energy, construction) and in low-income and fragile contexts where innovation ecosystems face distinct challenges. Finally, innovation system and collaboration gaps persist. The informal sector is frequently neglected in innovation studies, despite its importance in many developing economies. There is also a need to better understand how collaborative platforms can be sustained over time and how strategic reconfiguration can be operationalised to enhance ecosystem resilience.

### ***Emerging issues of interest in open innovation***

Several emerging issues are shaping the evolving landscape of open innovation partnerships in developing country contexts. Digital transformation and the integration of advanced digital tools are among the most prominent trends. The literature highlights growing interest in how digital platforms, ICT tools, and Industry 4.0 technologies can enable more inclusive and dynamic innovation ecosystems. Digital innovation platforms not only facilitate cross-sectoral

knowledge exchange but also offer new pathways for SMEs to access markets, partners, and technical resources. However, disparities in digital readiness and the risk of deepening digital divides remain critical concerns.

The development and application of new open innovation models and approaches is another key area of interest. Researchers and practitioners are increasingly exploring open innovation as a service model, as well as its integration with business model innovation and internationalisation strategies. Educational applications of open innovation are also gaining attention, particularly in relation to building innovation capabilities and entrepreneurial skills in developing contexts. SMEs and dynamic capabilities remain a focal point for emerging research. There is a growing emphasis on understanding how SMEs can develop the dynamic capabilities required to engage effectively in open innovation, and on designing SME-specific readiness frameworks and pathways for innovation-driven growth.

Intermediaries and collaboration mechanisms continue to evolve. The strategic use of intermediaries—both physical and digital—is seen as vital for facilitating knowledge flows, building trust, and enabling SMEs to participate in complex innovation ecosystems. The literature also highlights the importance of designing intermediary roles that are context-sensitive and adaptive to changing innovation dynamics. Finally, the intersection of open innovation with AI, platform ecosystems, and emerging technologies is a

**Table 2. Policy Recommendations**

Theme	Representative Policy Recommendations
Support for SMEs and Capability Building	<ul style="list-style-type: none"> <li>• Provide targeted training to enhance SMEs' learning capabilities and absorptive capacity for open innovation.</li> <li>• Support SMEs in developing dynamic capabilities for innovation, adaptability, and problem-solving.</li> <li>• Facilitate SME access to market intelligence, digital tools, and collaborative platforms.</li> <li>• Develop tailored SME-focused frameworks and toolkits for open innovation adoption in resource-constrained environments.</li> <li>• Introduce innovation vouchers and financial incentives to promote SME participation in innovation ecosystems.</li> </ul>
Infrastructure and Digital Transformation	<ul style="list-style-type: none"> <li>• Expand digital infrastructure and interoperability to enable broader SME participation in innovation networks.</li> <li>• Establish national open innovation hubs to support SME–intermediary partnerships.</li> <li>• Promote digital inclusion policies and cross-border ecosystem integration.</li> <li>• Strengthen STI incubator networks with a focus on SDG-aligned and green innovation.</li> </ul>
Policy and Strategic Frameworks	<ul style="list-style-type: none"> <li>• Embed open innovation principles in national SME development plans and industrial strategies.</li> <li>• Design adaptive innovation policies aligned with country-specific development priorities.</li> <li>• Develop SME-focused Fourth Industrial Revolution (4IR) policy instruments linked to innovation strategies.</li> <li>• Institutionalise platforms for experimental industrial policy and multi-stakeholder engagement.</li> </ul>
Partnerships and Ecosystem Development	<ul style="list-style-type: none"> <li>• Promote multi-actor collaboration across firms, institutions, and intermediaries to strengthen innovation networks.</li> <li>• Institutionalise UIG partnerships and expand industry involvement in academic and innovation initiatives.</li> <li>• Develop intermediary networks to facilitate SME integration into innovation ecosystems.</li> <li>• Support innovation ecosystems through investments in collaborative infrastructure and trust-building initiatives.</li> </ul>
Knowledge Sharing and Intermediaries	<ul style="list-style-type: none"> <li>• Facilitate structured knowledge transfer mechanisms between SMEs and external partners, including academia.</li> <li>• Establish university–industry liaison centres and intermediary platforms to support continuous collaboration.</li> <li>• Develop legal and technical standards for sustainable open government data (OGD) collaboration.</li> <li>• Promote balanced public-private collaborations in open-source and platform-based innovation ecosystems.</li> </ul>

Source: authors.



rapidly evolving frontier. AI-driven tools for knowledge exchange, innovation monitoring, and cross-functional integration are beginning to reshape how open innovation partnerships are designed and managed. At the same time, concerns around governance, ethics, and inclusivity are prompting calls for new frameworks to guide the responsible integration of AI into innovation ecosystems.

Summary tables of the analysis results and directions for further research are presented in Appendix B.<sup>2</sup>

### Policy Recommendations

Drawing on the thematic synthesis and identified research and practice gaps, this section presents key policy recommendations to strengthen open innovation partnerships for industrialisation in developing countries. These recommendations aim to inform policymakers, practitioners, and ecosystem stakeholders seeking to foster more inclusive, dynamic, and sustainable innovation ecosystems. Refer to table 2.

### Conclusion and Future Direction

This systematic review presents the critical role of open innovation partnerships in advancing industrialisation efforts in developing countries. The findings reveal that the evolution of open innovation practices encompassing inbound, outbound, and coupled approaches is reshaping how firms, particularly SMEs, engage with broader innovation ecosystems. University-industry-government collaborations, interme-

diary-facilitated networks, and digital platforms are emerging as central mechanisms for fostering innovation-driven industrial upgrading. However, effective implementation remains contingent on several enabling factors, including institutional trust, leadership commitment, digital readiness, and absorptive capacity within firms. Persistent barriers such as fragmented policy frameworks, infrastructure deficits, capability gaps, and weak coordination continue to constrain innovation outcomes. The strategic role of intermediaries in bridging knowledge flows and facilitating collaboration is increasingly evident, particularly in contexts where SMEs lack the internal resources to engage fully in open innovation.

The review also highlights key gaps in the literature, notably the need for SME-focused models, empirically validated frameworks, and improved indicators for assessing innovation impact in developing contexts. Furthermore, emerging trends such as the integration of AI and advanced digital technologies offer new opportunities but also introduce fresh challenges related to governance, inclusivity, and capacity building. To harness the full potential of open innovation for sustainable industrialisation, policymakers and practitioners must adopt tailored, context-sensitive strategies that strengthen innovation systems, foster cross-sectoral collaboration, and build the dynamic capabilities of firms and ecosystems alike. Future research should deepen empirical analysis, explore sector-specific dynamics, and develop actionable frameworks to support inclusive and adaptive innovation-driven industrial transformation.

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<sup>1</sup> The materials in the Appendix are available on the article's online page.: <https://foresight-journal.hse.ru/article/view/27979>



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