

APPENDIX

Table A1: Representative Theories

Theoretical Theme	Representative Theories/Models
Open Innovation and Related Models	Open Innovation Framework, Open Innovation and Co-Creation, Open Innovation Strategy, Knowledge Base View, Business Models, Open Innovation Theory, Open Innovation and Digital Collaboration, SME Development
Innovation Systems	National Innovation Systems (NIS), Sectoral/Regional Innovation Systems, Catch-up Theory, policy frameworks, Innovation systems theory, Network Theory
Dynamic Capabilities and Organizational Theory	Dynamic Capabilities Perspective, Resource-Based View and Contingency Theory, Dynamic Capabilities Theory, Organizational Ambidexterity, Organizational Competence and Digital Transformation
Triple Helix and Ecosystem Models	Triple Helix Model, Type 4 Triple Helix Model, Triple/Quadruple/Quintuple Helix, Living Labs
Technology and Digital Economy Theories	Technology adoption and trade openness frameworks, Technology Acceptance, Open Innovation, Additive manufacturing, technology diffusion, Digital Business Ecosystem Theory
Economic Development and Complexity Theories	Schumpeter's Economic Growth Theory, Product space theory, economic complexity, structural transformation, financial development, environmental degradation, innovation models, Industrial Policy, Development Economics, Global Value Chains, Development Economics

Source: Author's work

Table A2: Representative Focus Areas

Theme	Representative Focus Areas
Open Innovation in SMEs	Open Innovation in SMEs, Adopting Open Innovation for SMEs, Implementation of Open Innovation in SMEs, Open Innovation in Agri-Food MSMEs, Open Innovation in SMEs: Developing Contexts
University-Industry-Government (UIG) Partnerships	University-Industry-Government Partnerships, Partnership Development at the University–Industry–Government Nexus, Dynamic evolution of U-I-G relations under globalization
Innovation Policy and Systems	Innovation Systems Research, Innovation Policy: A Guide for Developing Countries, Designing an Industrial Policy for Developing Countries, Industrial Policy for the Twenty-First Century
Technology and Digital Transformation	Managing Innovation and Technology in Developing Countries, Implementations of ICT Innovations: Challenges in Developed vs. Developing Countries, Pervasive service architecture for a digital business ecosystem
Innovation Ecosystems and Collaboration	Innovation Networks, Understanding Innovation Ecosystems, Intermediated networks for SME collaboration, Collaboration in open government data ecosystems
Inbound and International OI	Inbound Open Innovation and SME, Innovation Performance, International OI and Market Success, OI and internationalization of SMEs

Source: Author's work

Table A3: Changes in partnership approaches

Theme	Representative Approaches
Formal and Informal Collaborations	Emphasizes informal partnerships and off-the-record interactions, Informal and formal business collaborations, Intermediated collaborations, Voluntary, open systems
University-Industry-Government (UIG) and Public-Private Partnerships	University–Industry–Government interactions (Triple Helix), University–industry, public–private partnerships, Govt-donor-innovator collaboration, Public–private incubators, international cooperation
Cross-sectoral and Multi-stakeholder Approaches	Horizontal, vertical, cross-sectoral alliances, multi-stakeholder collaboration, State–market–civil society experimentation, Stakeholder-inclusive collaboration
Inter-organizational and External Collaborations	Strategic partnerships, outsourcing, inter-organizational collaborations, Inter-organizational OI collaborations, Inter-organizational ecosystems
International and Global Collaboration	Cross-border corporate alliances, international collaboration, Int’l gov-academia-industry
Innovation Ecosystem and Platform-Based Collaboration	Living labs, science parks, regional platforms, intermediated and open platforms, Digital collaboration, Crowd engagement and platform use

Source: Author’s work

Table A4: Models of Open Innovation Partnerships

Theme	Representative Models/Typologies
National and Regional Innovation Systems	Formal/informal, competence/capability, multidimensional innovation systems, RIS in globalization context, Diverse NIS models across region, National innovation systems, NIS frameworks by development stage
Open Innovation and Collaboration Models	Open vs Closed innovation, Nine OI perspectives, Three OI dimensions: implementation, fear, performance, Typologies of OI adoption, Integrative OI framework, Inbound OI types
Triple/Quadruple/Quintuple Helix Models	Triple Helix, Outsourcing Models, Quintuple Helix; top-down vs. bottom-up, Triple Helix evolutionary model, Open Innovation vs Triple Helix, Quadruple Helix model
Ecosystem and Network Models	Ecosystem service models, Ecosystem collaboration model, Ecosystem vs platform-centric models, Intermediated Network Model, Intermediary-based OI networks, Living labs, shared platforms, participatory models
Dynamic Capabilities and Innovation Process	Dynamic capabilities framework, Dynamic Innovation Model, Five-stage incremental loop, Distinction between potential and realized absorptive capacity
Typologies by Context or Sector	Innovation via trade, FDI, licensing, Types of governance in GVCs, Industrial cluster dynamics, Typologies of SME strategies, Crowdsourcing types (idea, micro tasking, solution)

Source: Author’s work

Table A5: Key actors and stakeholder roles

Player/Actor Group	Representative Roles
Government	Policy enabler: infrastructure provider, Government provides conducive policy environment and infrastructure, Policy formulation and support, Regulatory and financial support, Support for digital infrastructure, Main actor in creating incubators, Facilitator of innovation ecosystem
Academia and Research Institutions	Knowledge generator, limited formal collaboration with industry, Universities as sources of ideas, suggesting collaboration with academia, Academic anchor, Researchers and development, Education and research hubs
Private Sector and Firms	Private sector focuses on commercialization and scaling innovations, Technology providers, Innovation adopters
Civil Society and Intermediaries	Bridging gaps, user advocacy, Facilitators of culture shift and user feedback, supports intermediaries, Intermediaries enable innovation, Community engagement and delivery
SMEs and Entrepreneurs	SMEs as focal actors, adopt OI, SME innovation application, SMEs implementing agility, SMEs enhancing capabilities for internationalization, SMEs benefiting from intermediary facilitation

Source: Author's work

Table A6: Enablers of Effective Open Innovation Partnerships

Theme	Key Enabling Factors
Trust and Social Capital	Trust-based networks, Trust, knowledge flows, IP strategies, collective action, informal interaction, tailored policy support, communication, shared goals, IP regimes, digital infrastructure, transparent networks
Leadership and Strategic Alignment	Top management support, user training, consultant management, cultural/strategic alignment, Leadership traits, marketing, digital readiness, benefit perception, Strategic alignment, resource planning, funding, education
Digital Infrastructure and Readiness	Digital readiness, support, ICT access, effective policies, Digital platform architecture, interoperability, Policy incentives, digital infrastructure, ICT availability, education, financing, Digital literacy, access to ICT tools
Policy and Institutional Environment	Effective policies, education, infrastructure, access to finance, skilled labor, Contextualized policy frameworks, institutional collaboration, Policy coherence and cross-institutional trust, R&D investment, supportive policies
Organizational Capabilities and Learning	Organizational learning and adaptability, learning capabilities, learning orientation, Absorptive capacity, -Internal innovation culture, external collaboration channels, Dynamic learning and resource integration
Networks, Ecosystems and Collaboration	Interaction among ideas, individuals, and organizations, Network competence, social capital, Access to networks and training, Strong network ties, intermediary support, Effective intermediaries, Collaboration with partners

Source: Author's work

Table A7: Barriers and Challenges

Theme	Representative Barriers
Institutional and Policy Weaknesses	Poor infrastructure, underfunding, low skills, Limited policy support, Institutional resistance, lack of absorptive capacity, Mismatch of models, weak institutional capacity, poor IP enforcement
Infrastructure and Resource Constraints	Lack of resources, strategy misfit, Infrastructure and financial constraints, IP concerns, digital literacy, lack of expertise
Cultural and Organizational Resistance	Cultural resistance, inadequate metrics, Internal resistance, lack of absorptive capacity, change resistance, Overreliance on internal incentives, leadership gaps
Knowledge and Capability Gaps	Limited dynamic capability understanding, Lack of awareness/resources, Skills gaps, weak market and policies, Limited collaboration opportunities, poor access to tech
Fragmentation and Coordination Issues	Siloed departments, resistance to share, Fragmented support and international competition, Fragmented implementation, Power imbalances, unclear value distribution
Legal, IP, and Data Barriers	Legal copyright issues, high equipment cost, IP protection concerns, resource asymmetry, Data privacy, legal frameworks

Source: Author's work

Table A8: Thematic Synthesis of Literature

Theme	Representative Insights
Innovation Systems and Contextualization	Multidimensional view of innovation, informal and formal linkages, Contextualizing innovation systems for the developing world, Tailored innovation systems, Integrated support ecosystems, Need for integrated NIS approaches
Open Innovation and Collaboration	Shift from closed to open innovation, importance of external knowledge, role of business models, Open innovation as development tool, OI co-creation for innovation, Open collaboration as productive form, Mainstreaming OI
Digital Transformation and Infrastructure	Digital ecosystem architecture and openness, Open digital ecosystems, Inclusive digital growth, Digital transformation is multifactorial for SMEs, Digital collaboration bridges innovation gaps
Dynamic Capabilities and Organizational Learning	Critical role of dynamic capabilities, Strategic agility via capabilities, Capabilities as foundation for OI success, Organizational enablers for OI, Organizational capability and innovation synergy
Policy and Institutional Support	Need for tailored innovation management, Need tailored policy support, Need for innovation policy intermediaries, Policy alignment and education, Need for structured support to SMEs
Intermediaries and Networks	Intermediaries make OI viable in developing countries, Networks as bridges in innovation systems, multi-level innovation network dynamics, Trust-based network innovation

Source: Author's work

Table A9: Gaps in research, policy and practice

Theme	Representative Gaps
Empirical Validation and Evidence Gaps	Empirical validation needed, Lack of empirical cases, Empirical application needed, Lack of empirical evidence on long-term impacts, Need for empirical research, Quantitative evidence on long-term OI impact
SME-Specific Gaps	Lack of SME-specific models, SME-specific innovation metrics, Policy framework for SME OI missing, SME-specific OI toolkits for LMICs, SME barriers in low-income countries
Policy and Institutional Gaps	Policy gaps in knowledge-based eco-innovation, Lack of alignment between policy design and growth theories, Insufficient adoption in policy frameworks, Limited study of SGCs' intermediary role, Context-specific tailoring, local capacity
Measurement and Indicators	Weak measurement indicators, over-aggregation, Need for empirical validation of metrics, Lack of harmonized indicators across regions, Ecosystem measurement metrics, how to measure absorptive capacity effectively
Sector and Regional Gaps	Limited comparative studies across developing countries, more non-European studies needed, Sector-specific analysis of capabilities, Sector-specific disaggregation and regional innovation contexts, Emerging country-specific studies
Innovation System and Collaboration Gaps	Neglect of informal sector, Sustainability of collaborative platforms, Operationalizing strategic reconfiguration, Need for frameworks for co-creation

Source: Author's work

Table A10: Emerging issues of interest in open innovation

Theme	Key Focus Areas
Digital Transformation and Tools	Digitalization in OI, Digital tools in SMEs, Digital tech integration, Role of digital tools in co-creation, Digital platforms enabling OI, Digital innovation platforms, Digital infrastructure for OI, Digital tools to manage external knowledge, Digital intermediation
Open Innovation Models and Applications	Open innovation for SMEs, Open innovation as a service model, Open business models, SME OI adoption, educational applications of open innovation, OI in developing contexts, Firm-level OI strategies, Integration of open innovation in internationalization strategies
SMEs and Dynamic Capabilities	Dynamic capabilities in SMEs, Operationalizing dynamic capabilities, SME-specific OI readiness frameworks, SME-driven OI pathways
Intermediaries and Collaboration	Strategic use of intermediaries, Role of intermediaries in OI adoption, Intermediaries in SME networks, Digital intermediaries, global networks
AI, Platforms, and Emerging Tech	AI-readiness, cross-functional integration, AI and knowledge exchange, AI and automation in OI, AI-driven innovation monitoring tools, Platform ecosystems and policy interface
Inclusive and Sustainable Innovation	Green innovation, inclusive systems, Eco-innovation and bioeconomy, Sustainable finance, green innovation dynamics, Incubation for green innovation

Source: Author's work