

**ADAPTIVE GOVERNANCE FOR INNOVATION IN
RESOURCE-CONSTRAINED ECONOMIES: LESSONS FROM
NATIONAL INNOVATION SYSTEMS IN RWANDA AND VIETNAM
(2000-2024)**

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Abstract

In the early 2000s, both Rwanda and Vietnam faced daunting developmental challenges: shattered institutions, scant R&D budgets and a shortage of skilled human capital in the wake of crises and centrally planned stagnation. Yet, by 2024 they had both ascended the Global Innovation Index rankings, demonstrating that even the most resource-scarce environments can become fertile ground for technological and institutional renewal. This thesis sets out to explain how these two seemingly disparate nations operationalized “adaptive governance” to transform scarcity into a catalyst for innovation. At its heart lies a single, guiding question: How have Rwanda and Vietnam operationalized adaptive governance for innovation in resource-limited contexts between 2000 and 2024 in ways that reflect or extend dominant theoretical frameworks for innovation? . This inquiry emerges from a recognized gap in innovation studies, which traditionally focus on OECD contexts or large emerging markets, overlooking the “periphery” where institutional fragility demands new governance logics. To answer this question, the study employs a comparative, interpretive case-study design grounded in two streams of evidence. First, an extensive document analysis of national strategy documents—Vision 2020/2050, Rwanda’s NICI ICT plans, Vietnam’s Đổi Mới reforms, successive Science and Technology Master Plans—and donor and legislative reports provides a rich narrative of policy evolution. Second, standardized comparative indicators (R&D intensity, ICT penetration, higher-education enrollments, entrepreneurship activity) drawn from the Global Innovation Index, UNESCO science reports and World Bank data anchor those narratives to observable trends. Analytically, the thesis weaves together three complementary frameworks. National Innovation Systems (NIS) maps the structural foundations (institutions, networks, funding flows) that underpin each country’s innovation ecosystem; Adaptive Governance, operationalized through Gupta et al.’s Adaptive Capacity Wheel (ACW) and Andrews et al.’s Problem-Driven Iterative Adaptation (PDIA), diagnoses how governance bodies learn, iterate and re-calibrate policy levers under constraint; and finally, Effectuation theory illuminates the micro-level decision logic such as leveraging “bird-in-hand” resources, accepting affordable losses, and “making lemonade” of surprises, that drives entrepreneurial and policy improvisation in uncertain settings. The findings reveal two distinct yet converging pathways: Rwanda’s state-centric model embeds visionary planning and performance contracts within tight feedback loops to scale pilot successes rapidly, whereas Vietnam’s multiscalar approach leverages provincial experimentation and private-sector

improvisation ahead of formal policy adaptation. In both cases, effectual practices, means-driven action, stakeholder co-creation, affordable loss, are scaffolded by institutional mechanisms that enable learning and recalibration. Through its research, this study shows that deliberate institutional flexibility and inclusive stakeholder engagement can generate resilient innovation pathways under constraint, and that a hybrid framework integrating NIS, adaptive governance, and effectuation offers a richer, context-sensitive theory for innovation in the Global South.

Keywords: Rwanda, Vietnam, Adaptive governance, Resource-limited innovation, Global Innovation Index, National Innovation Systems, Adaptive Capacity Wheel, Problem-Driven Iterative Adaptation, Effectuation theory, Institutional flexibility

Table of Contents

1.Introduction.....	6
1.1 Time, Space and Action Context.....	6
1.2 Research Objectives and Relevance.....	8
1.3 Research Questions.....	9
1.3.1 Main Research Question.....	9
1.3.2 Sub Questions.....	9
1.4 Hypotheses.....	9
1.5 Structure of the thesis.....	10
2.Theoretical Frameworks.....	12
2.1 Overview of Key Theories.....	12
2.2 Adaptive Governance.....	14
2.3 National Innovation Systems.....	19
2.4 Effectuation.....	25
3. Methodology.....	30
3.1 Research Design and Comparative Strategy.....	30
3.2 Case Selection.....	30
3.3 Data Collection Methods.....	30
3.4 Analytical Framework.....	31
3.4.1 Institutional Foundations: Mapping the National Innovation System.....	31
3.4.2 Governance Dynamics and Adaptive Capacity.....	32
3.4.3 Effectuation as Strategy under Constraint.....	33
3.4.4 Outcomes Synthesis and Framework Alignment.....	33
3.5 Methodological Limitations.....	33
4. The Rwandan Case.....	36
4.1 From Reconstruction to Innovation.....	36
4.2 Mapping Institutional Foundations in Rwanda's National Innovation System.....	37
4.3 Governance Dynamics and Adaptive Capacity.....	51
4.3.1 Evaluating Rwanda's Adaptive Capacity through the ACW.....	53
4.3.2 Hidden PDIA: Umuganda as De Facto Model of Iterative Problem Solving.....	60
4.4 Effectuation as Strategy under Constraint.....	63
5. The Vietnam Case.....	70
5.1 Introduction.....	70
5.2 Institutional Foundations in Mapping Vietnam's National Innovation System.....	71
5.3 Governance Dynamics and Adaptive Capacity.....	80
5.3.1 Evaluating Vietnam's Adaptive Capacity through the ACW.....	81
5.3.2 PDIA in Vietnam.....	89
5.4 Effectuation as Strategy under Constraint.....	91
6. Comparative Analysis: Innovation Governance in Rwanda and Vietnam.....	95
6.1 Innovation System Structures: Comparative Strengths and Gaps.....	95
6.2 Comparative Governance Dynamics and Adaptive Capacity.....	99

6.3 Comparative Effectual Practices and Strategic Improvisation.....	105
7: Conclusion and Theoretical Reflections.....	108
7.1 Revisiting Hypotheses and Responding to Core Research Question.....	108
7.2 Emergent Insights for Innovation in Resource-Constrained Contexts.....	110
7.3 Directions for Future Research.....	112
Bibliography.....	114

1.Introduction

1.1 Time, Space and Action Context

Why have Rwanda and Vietnam—two countries shaped by vastly different histories and constrained by limited resources—emerged as innovation leaders in their regions?

In the 21st century, innovation policy has become a key development driver, particularly in resource-limited economies where traditional market forces struggle to foster technological progress and entrepreneurship. While advanced economies have long benefited from established innovation ecosystems, nations with limited financial, institutional, and infrastructural resources face distinctive challenges in fostering innovation. Although early economic models often positioned the state as the central actor in driving industrialization and technological progress, Rwanda and Vietnam have maintained strong state leadership in their innovation policies, though their governance frameworks are increasingly strategic and flexible. While Rwanda has developed a highly centralized state apparatus that drives innovation through performance-based policies and long-term planning, Vietnam's model combines state coordination with market-driven reforms. In both cases, the state's role is key, yet it is marked by adaptability—learning from past experiences, making course corrections, and leveraging networks to drive innovation in the face of resource constraints.

Since 2000, Rwanda and Vietnam have pursued distinctive yet comparable strategies aimed at transforming their economies through state-led innovation policies. Once defined by post-conflict reconstruction and command economies, Rwanda and Vietnam now stand as examples of innovation resilience in the Global South. This makes them not only statistical outliers, but strategic exemplars for rethinking the policy levers available to governments navigating developmental challenges without the institutional depth or capital of high-income states. Rwanda's *Vision 2020* and its successor, *Vision 2050* focused on ICT-driven development, infrastructure expansion, and human capital investments to transition the nation into a knowledge-based economy. Vietnam, leveraging lessons from its 1986 *Đổi Mới* (Renovation) reforms, embraced deeper global integration, industrial upgrading, and institutional reforms to sustain its transition to a middle-income country. Vietnam's decades-long engagement with socialist central planning followed by the sweeping economic liberalization of *Đổi Mới* created a

hybrid governance model that blends state coordination with market-oriented incentives. In contrast, Rwanda's post-genocide reconstruction efforts forged a highly centralized and technocratic state apparatus, characterized by performance-based governance, long-term visioning, and strategic partnerships with international donors and private actors. These contrasting institutional histories have produced distinct yet similarly adaptive innovation systems—both characterized by experimentation, coalition-building, and iterative policy learning—which have resulted in globally recognized innovation outcomes. Rwanda consistently ranks as the top innovator among low-income economies, while Vietnam holds the second-highest rank among middle-income economies in the Global Innovation Index (GII). These rankings underscore the significance of studying these nations as models for process innovation governance despite structural constraints.

Three complementary theoretical frameworks are used in the analysis: Adaptive Governance, National Innovation Systems (NIS) and Effectuation. The chosen frameworks were selected for their complementary capacities to explain how innovation emerges within top-down institutional frameworks and through adaptive strategies of individual actors navigating uncertainty. Adaptive Governance emphasizes the flexibility, feedback loops, and coordination mechanisms that enable innovation systems to respond to complexity and evolve over time. NIS provides a macro-level analysis of the structures, actors, and relationships that underpin National Innovation Systems, while Effectuation complements by focusing on the micro-level dynamics of decision-making within innovation processes. The relevance of this integrated approach becomes particularly evident when applied to the unique developmental paths and policy environments of Rwanda and Vietnam that have necessitated iterative learning, stakeholder alignment, and adaptive institutional design.

Despite their advancements, Rwanda and Vietnam remain under examined in mainstream innovation studies, which tend to focus on OECD countries or larger emerging economies. This analytical gap reflects broader trends in the literature, where dominant theories often overlook the creativity, agility, and policy experimentation unfolding in smaller or post-conflict states, despite their relevance to global debates on inclusive innovation. However, this relative scholarly neglect presents a unique analytical opportunity to examine how policy design, institutional learning, and adaptive governance play out in contexts characterized by high uncertainty and

constrained capacity. Moreover, a comparative exploration of the two countries not only reveals how innovation is governed under constraint, but also how context shapes the translation of broad governance frameworks into policy practice. Their experiences test the versatility of these frameworks in environments far removed from the typical contexts in which they were developed—often Western, entrepreneurial, or high-capacity settings. It also positions both countries as conceptual laboratories, where hybrid governance strategies and emergent institutional forms offer globally relevant insights in contexts marked by institutional and developmental asymmetries.

These gaps in theory and practice motivate this thesis, which aims to ground the policy lessons and theoretical insights that emerge when innovation is studied from the periphery rather than the core. By examining the two-decade trajectories of Rwanda and Vietnam (2000–2024), it explores how national innovation strategies evolve under constraint, how governance frameworks are adapted to local realities, and how theoretical models are translated into practice outside their original contexts. In doing so, the research contributes to a more pluralistic, context-sensitive theory of innovation governance.

1.2 Research Objectives and Relevance

This research aims to: *i) Trace the key institutional choices, policy tools, and governance mechanisms that comprise the adaptive evolution of innovation policy in Rwanda and Vietnam between 2000 and 2024; ii) assess the extent to which their policy design and governance models align with or diverge from established theoretical frameworks such as Adaptive Governance, National Innovation Systems (NIS) and Effectuation, particularly in low-capacity settings; iii) evaluate how local cultural, institutional, and historical dynamics, as well as resource constraints and “glocal” economic transformations, influenced the appropriation and adaptation of these frameworks into actionable policy within each national context.*

This thesis investigates how countries blend long-term strategic visioning with bottom-up experimentation, coalition-building, and iterative learning to foster innovation resilience. By examining how innovation systems are designed and adapted in resource limited contexts, the research illuminates practical frameworks for achieving sustainable development and equitable

growth. From a scientific perspective, the study bridges significant gaps in the existing literature by interrogating the interplay between governance structures, cultural dynamics, and collaborative networks in innovation policy. Finally, by integrating entrepreneurial decision-making frameworks with systemic approaches, the study challenges conventional paradigms and fosters interdisciplinary dialogue.

1.3 Research Questions

1.3.1 Main Research Question

How have Rwanda and Vietnam operationalized adaptive governance for innovation in resource limited context between 2000 and 2004 in ways that reflect or extend dominant theoretical frameworks for innovation?

1.3.2 Sub Questions

1. To what extent do the innovation strategies of Rwanda and Vietnam embody the design, logic and practices associated with NIS and Effectuation frameworks?
2. What role have contextual factors, including local cultural, institutional, and historical dynamics, and resource constraints and “glocal” economic transformations played in shaping the design and implementation of innovation policies in Rwanda and Vietnam since 2000?
3. What do the convergences and divergences in Rwanda’s and Vietnam’s innovation policy approaches reveal about the adaptability and limits of dominant innovation governance theories in resource-limited settings?

1.4 Hypotheses

The following hypotheses aim to test the extent to which the countries’ innovation strategies reflect or extend dominant theories of innovation governance and to explore how local dynamics such as crisis legacies, institutional capacity, and cultural factors shape policy outcomes.

H1. Innovation policy in both countries has evolved through iterative feedback and institutional learning, suggesting that adaptive governance mechanisms such as experimentation,

decentralization, and mid-course correction are central to innovation success in resource-constrained environments.

H2: Rather than impeding innovation, the specific contextual conditions of Rwanda and Vietnam—including historical disruptions, governance evolution, and social dynamics—have fostered adaptive policy innovation by instilling resilience, socio-institutional trust, and a culture of experimentation within their governance models—resulting in frameworks that partially reflect but also transcend existing theories.

H3. The differences in Rwanda's and Vietnam's innovation trajectories and policy logics-top-down strategic vision versus decentralized institutional learning- suggest that dominant innovation governance theories, while useful for framing, are insufficient to explain the complexity and variability of innovation emergence in the Global South and require reconceptualization to account for non-linear and politically embedded processes.

1.5 Structure of the thesis

Chapter 2 sets out the conceptual foundations for analysis. It introduces Adaptive Governance to examine the relational space between top-down authority and grassroots agency, National Innovation Systems (NIS) to visualize how institutional infrastructures and actor networks drive domestic innovation performance and Effectuation to shift attention to how individuals and organizations innovate through improvisation, resource leverage, and iterative learning. *Chapter 3* outlines the research design and methodological choices. It justifies the use of a comparative case study approach and provides an overview of the data collection strategy. The analytical tools, and the comparative logic guiding the cross-case synthesis are also discussed. This chapter also reflects on challenges such as cross-context comparability, data limitations, and researcher positioning. Attention is given to how interpretive analysis is conducted and how empirical material is situated within the broader theoretical landscape.

Chapters Four and Five present both case studies. *Chapter Four* focuses on Rwanda and explores how the country has conceptualized and operationalized innovation as part of its broader post-conflict development strategy. It begins by situating Rwanda's innovation agenda within the context of its long-term visioning tools (*Vision 2020*, *NICI Plans*, and *Vision 2050*) and its

highly centralized, performance-based governance model. This section assesses how early investments in research, skills, and coordination structures set the stage for innovation. The next section turns to governance dynamics to investigate iterative policymaking, strategic coherence, and performance management through initiatives like *EDPRS* and the *Smart Rwanda Master Plan*. The chapter ends by engaging the Effectuation framework to highlight bottom-up and experimental dimensions of Rwanda's approach.

Chapter Five discusses the Vietnam case, beginning with the legacy of the Đổi Mới reforms and exploring how innovation has been pursued through a blend of central direction and decentralized experimentation through the *Science and Technology Development Strategy*, and the *Master Plan on NIS*. It includes a brief overview of the historical dimensions, highlighting how the shift from a socialist command economy to a globally integrated market system laid the foundation for a hybrid model of governance. As in the Rwanda chapter, multiple theoretical lenses are applied to unpack Vietnam's innovation strategies. Strategic programs like the *Socio-Economic Development Strategy*, *Resolution 52*, and the *Technology Innovation Program* highlight industrial advancements, effectuation-thinking international investment, and science and technology policy within a fragmented yet evolving institutional landscape.

Chapter Six provides a side-by-side comparative analysis of Rwanda and Vietnam, drawing on the empirical findings from the preceding chapters. It is structured around key dimensions of the study: the strengths and gaps within each country's National Innovation System (NIS); the nature of governance logics and the extent of policy adaptability—analyzed using both the Adaptive Capacity Wheel (ACW) and Problem-Driven Iterative Adaptation (PDIA); and the presence of effectual practices and strategic improvisation in innovation strategy and implementation. The final chapter synthesizes the results of the study by responding to the research question and hypotheses. Lastly, it acknowledges the study's limitations and identifies avenues for future research.

2.Theoretical Frameworks

2.1 Overview of Key Theories

Where uncertainty, institutional fragility, and constrained capacities define the policy landscape, there is a need for more than one-size-fits-all models. The traditional emphasis on stable institutions, formal R&D ecosystems, and long-term planning offers limited explanatory power in contexts marked by volatility, fragmentation, and fiscal scarcity and mark a need to update current innovation literature. Given this context, this thesis draws on 3 conceptual frameworks: *Adaptive Governance*, *National Innovation Systems (NIS)* and *Effectuation*.

Adaptive governance critiques rigid, hierarchical models of institutional design and instead emphasizes iterative, multi-scalar processes of experimentation and mutual learning as summarized by Dietz et al.(2003).¹ Ostrom (2005) introduced polycentric governance, decentralized yet interconnected systems.² Within this framework, local actors have more autonomy but are also embedded in broader institutional structures. However, their work lacked a diagnostic tool for assessing adaptive capacity, especially critical in low-resource settings. Gupta et al. (2010) addressed this gap through the Adaptive Capacity Wheel (ACW), a tool for assessing institutional readiness for innovation.³ There was also a need to translate theory into practice via actionable policy tools. Andrews et al. (2013) operationalizes adaptive governance at the local level through the PDIA which emphasizes policy experimentation, learning-by-doing, and iterative-problem solving.⁴ Empirical work such as Coyoli (2022) on bottom-up education policy initiatives demonstrate how such frameworks are not only theoretical ideals but often pragmatic necessities at the micro-level when there is limited capacity.⁵⁶

¹Dietz, Thomas, Elinor Ostrom, and Paul C. Stern. "The Struggle to Govern the Commons." *Science* 302, no. 5652 (2003): 1907–1912. <https://doi.org/10.1126/science.1091015>

² Ostrom, Elinor. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press, 2005

³ Gupta, Joyeeta, Catrien Termeer, Judith Klostermann, Sandra Meijerink, Mirjam van den Brink, Pier Vellinga, and Jeroen Biermann. "The Adaptive Capacity Wheel: A Method to Assess the Inherent Characteristics of Institutions to Enable the Adaptive Capacity of Society." *Environmental Science & Policy* 13, no. 6 (2010): 459–471. <https://doi.org/10.1016/j.envsci.2010.05.006>.

⁴ Andrews, M., Pritchett, L., & Woolcock, M. (2013). Escaping capability traps through Problem-Driven Iterative Adaptation (PDIA). *World Development*, 51, 234–244.

⁵ Fidelman, Pedro, Nadine Marshall, Sarah Park, Terence J. McClanahan, and Timothy R. C. Hales. "Governance of Climate Adaptation in the Great Barrier Reef Region: A Network Analysis of Actors, Institutions, and Issues." *Global Environmental Change* 42 (January 2017): 1–14. <https://doi.org/10.1016/j.gloenvcha.2016.10.001>.

⁶ Smith Coyoli, Julia. "Education Reform and Teachers' Unions in Mexico." *ReVista: Harvard Review of Latin America*, November 3, 2022. <https://revista.drclas.harvard.edu/education-reform-and-teachers-unions-in-mexico/>.

Sarasvathy (2001) developed the Effectuation framework to conceptualize how entrepreneurs make decisions in highly uncertain and resource-scarce environments. Unlike traditional causal reasoning (which begins with a goal and optimal strategies), Effectuation focuses on what is already available to the decision-maker—the “bird-in-hand” principle—and builds outcomes from existing means. Other core principles include focusing on affordable loss over expected returns, forming partnerships to co-create opportunities (“crazy quilt”), and embracing the unexpected (“lemonade”). While initially developed to explain firm-level behavior, scholars have increasingly explored its relevance to public policy and governance to explain the character of innovation under constraint at the micro-level where formal institutions are still evolving. However, its application to macro-level systems remains limited, often underplaying structural and institutional influences.⁷

In contrast, the National Innovation Systems (NIS) framework, introduced by Christopher Freeman (1987) in his study of Japan’s postwar development, offers a macro-institutional approach to innovation. Freeman highlighted the importance of long-term policy planning to maintain institutional coherence. Building on his work, Lundvall (1992) introduced a more interactive dimension by emphasizing learning-by-doing and user-producer relationships.⁸ Nelson (1993) reinforced the framework’s empirical breadth through comparative studies of national R&D systems to identify how institutional variety shaped innovation outcomes, while Charles Edquist (1997) emphasized the importance of aligning policy design with institutional context to promote coordinated innovation.⁹ All four scholars framed innovation as a socially embedded, institutionally mediated process. Yet critiques of NIS highlight its limited applicability to countries outside the OECD, where institutional capacity and path dependencies may deviate significantly from the assumed norms.

Each framework offers distinct insights that overlap and contrast in important ways. Where NIS focuses on structure, coordination, and institutional embeddedness, Effectuation highlights agency, improvisation, and local knowledge. Adaptive Governance bridges the two by emphasizing the iterative, relational processes through which systems adapt and learn. The three

⁷ Sarasvathy, S. D. (2001). “Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency.” *Academy of Management Review*.

⁸ Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan*; Lundvall, B.-Å. (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*.

⁹ Nelson, R. R. (1993). *National Innovation Systems: A Comparative Analysis*; Edquist, C. (1997). *Systems of Innovation: Technologies, Institutions and Organizations*.

frameworks together provide an interpretive toolkit for analyzing how Rwanda and Vietnam have crafted innovation policies in the 21st century and help us trace how both countries have negotiated between structure and agency, planning and improvisation, formal systems and informal networks.

2.2 Adaptive Governance

Adaptive governance has evolved from an environmental management tool into a broader framework for governing complex systems. The concept was first introduced in Dietz, Ostrom, and Stern (2003) within social-ecological systems. They challenged centralized governance models, arguing that polycentric systems—where multiple actors at various levels interact—are more effective for managing common-pool resources. Top-down models, they argue, lack flexibility, exclude local knowledge, and struggle with system complexity, hindering adaptation, especially in resource-constrained environments. Ostrom's subsequent work later emphasized multi-layered institutions that absorb feedback and support learning. For Ostrom, adaptive governance requires institutional learning, shared decision-making, and diverse governance designs. Folke et al. (2010) extended the concept with “resilience thinking,” stressing its value for rapidly changing systems..¹⁰ They contend that in low-resource contexts, development and innovation must navigate uncertainty through trial and error. The paper advocates integrating scientific, local, and experiential knowledge to keep innovation contextually relevant. This framework of “resilience thinking” also highlights the need to assess adaptive capacity of institutions and specific toolkits for adaptive governance. Gupta et al. (2010)’s Adaptive Capacity Wheel (ACW) offers a diagnostic tool to assess and strengthen governance systems under pressure.

¹⁰ Folke, Carl, Stephen R. Carpenter, Brian Walker, Marten Scheffer, Thomas Chapin, and Johan Rockström. 2010. “Resilience Thinking: Integrating Resilience, Adaptability and Transformability.” *Ecology and Society* 15 (4): 20. <https://www.ecologyandsociety.org/vol15/iss4/art20/>.

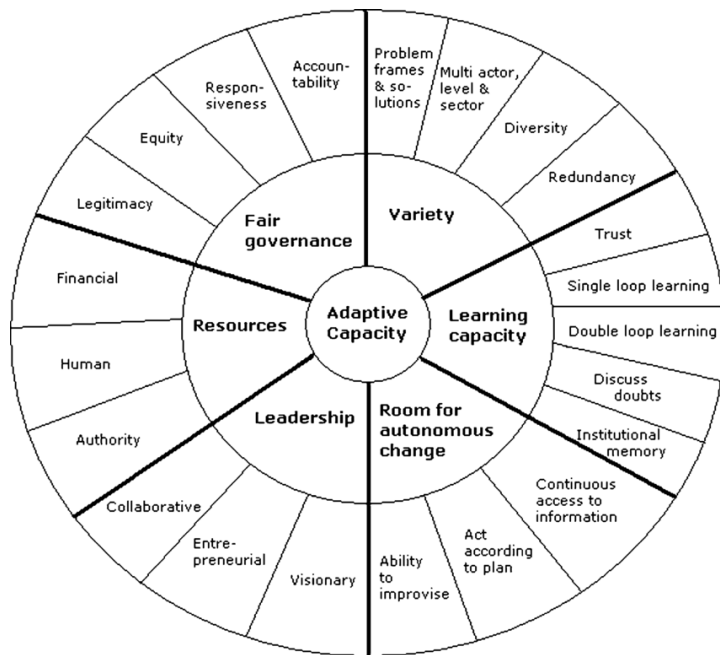


Diagram 1: The Adaptive Capacity Wheel (Gupta et al. 2010)

The six dimensions have been practically applied in several studies to evaluate institutions' adaptive capacity. Jacobs, Rivett, and Chemisto (2018) applied the ACW to two rural South African municipalities, showing that despite adaptive intent, governance was constrained by limited resources and weak institutions..¹¹ Moderate autonomy existed, but inadequate resources affected adaptation, highlighting the need for institutional support. Strong leadership and inclusion efforts improved equity, but financial and human constraints, along with limited learning capacity, reduced adaptive capacity—factors they argue are underemphasized in the ACW. Fidelman et al. (2017) used the ACW to study coastal co-management in Cambodia and Vietnam, finding that leadership, resources, and local autonomy enhanced adaptive capacity.¹² They also note the ACW overlooks informal institutions, which are crucial in co-management contexts like Cambodia and Vietnam. Given that the ACW was designed as a qualitative diagnostic tool, its previous uses does not prescribe a numerical scoring system. Hence the scoring approach in this study is an analytical adaptation to facilitate cross-country comparison.

¹¹ Carl Jacobs & Ulrike Rivett & Musa Chemisto, 2019. "Developing capacity through co-design: the case of two municipalities in rural South Africa," *Information Technology for Development*, Taylor & Francis Journals, vol. 25(2), pages 204-226. DOI: 10.1080/02681102.2018.1470488

¹² Fidelman, Pedro, Truong Van Tuyen, Kim Nong, and Melissa Nursey-Bray. "The Institutions–Adaptive Capacity Nexus: Insights from Coastal Resources Co-Management in Cambodia and Vietnam." *Environmental Science & Policy* 76 (2017): 103–112. <https://doi.org/10.1016/j.envsci.2017.06.018>.

Though the ACW framework offers valuable insights into institutional strengths and weaknesses, its emphasis on top-down structures and resource availability can be restrictive in settings where these are limited. In contrast, the PDIA approach (Andrews et al., 2013) offers a decentralized, experimental model of adaptive governance based on local problem-solving and iterative learning.¹³

Figure 1. **A six-stage “find and fit” iteration within the PDIA approach**

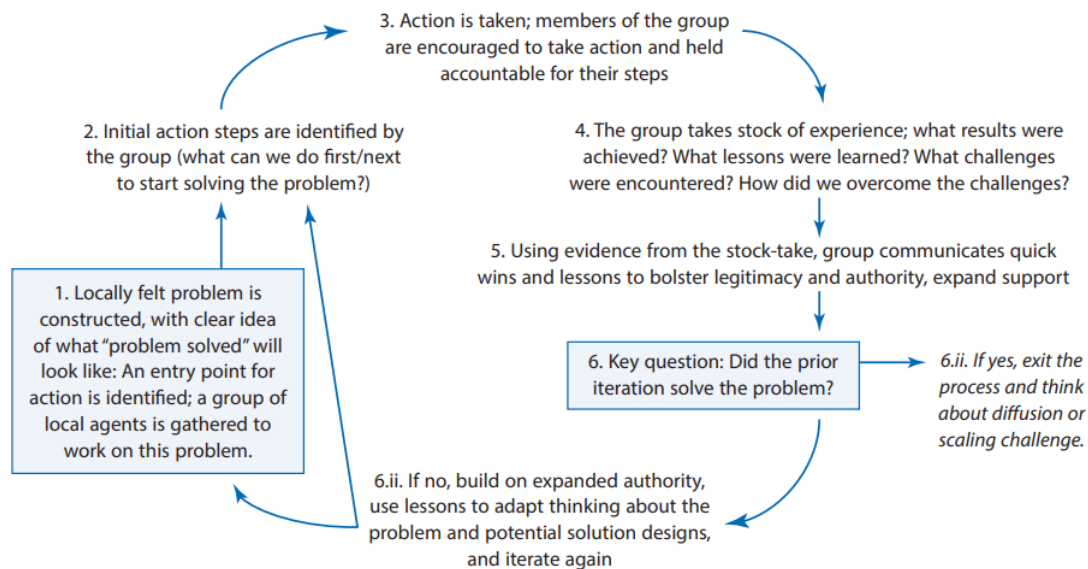


Diagram 2: *The PDIA APPROACH (Andrews, Pritchett, and Woolcock 2013)*

PDIA has been applied to diverse challenges through iterative, locally driven adaptations. In Sobral, Brazil, PDIA raised second-grade literacy to 91% through iterative cycles of teacher training, pedagogical reform, and assessment.¹⁴ In Croatia, PDIA addressed underused digital health systems by piloting stakeholder-driven projects, boosting platform use by 40% in one year.¹⁵ Despite these results, Ranjan (2021) notes that in centralized systems, PDIA faces

¹³ Andrews, Matt, Lant Pritchett, and Michael Woolcock. “Escaping Capability Traps through Problem Driven Iterative Adaptation (PDIA).” *World Development* 51 (2013): 234–244. <https://doi.org/10.1016/j.worlddev.2013.05.011>.

¹⁴ McNaught, Tim. *A Problem-Driven Approach to Education Reform: The Story of Sobral in Brazil*. RISE Insight Note 2022/039. March 2022. https://doi.org/10.35489/BSG-RISE-RI_2022/039

¹⁵ Barjum, Daniel, and Matt Andrews. *PDIA to Break Silos and Learn by Doing: A Case Study on the First Stage of Agile Engagement in Croatia’s Digital Health System Policy*. Cambridge, MA: Building State Capability, Harvard Kennedy School, 2021. <https://bpb-us-e1.wpmucdn.com/websites.harvard.edu/dist/c/104/files/2023/04/Croatia.pdf>.

disincentives for failure and uneven policy enforcement.¹⁶ Lawson and Harris (2023) also warns that PDIA struggles with politically sensitive reforms and may lack long-term impact without high-level political support, echoing Hadden (2014) in that PDIA risks becoming a checklist or a "best practice" if it is not continuously adapted to specific contexts.¹⁷¹⁸

Despite the success of polycentric governance models in managing resources, 10 years of adaptive governance scholarship documented in Chaffin, Gosnell, and Cosens (2014) noted that power imbalances within these models often led to exclusionary outcomes, particularly in developing countries, where local governance structures may be weak or marginalized.¹⁹ This synthesis highlights a critical challenge for adaptive systems: while they offer flexibility and resilience, they must also address underlying power structures and inequities that shape governance. Cases from Ethiopia, Zimbabwe, and Myanmar show that marginalized groups, despite their key roles in innovation, are often excluded from governance in water, climate, and education sectors.²⁰²¹²² The implication here is that adaptive governance must allow various stakeholders, especially marginalized communities, to actively participate in the innovation process. Datta and Chaffin (2022) also challenges the assumptions of state-centric adaptive governance, remarking on local knowledge and informal governance mechanisms in fisheries management in Solomon Islands.²³ There, customary governance oversees daily fisheries management, while state law provides broader oversight. Together, they allow for adaptive and flexible governance.

¹⁶ Udit Ranjan Understanding Problem Driven Iterative Adaptation and Its Limitations." *Accountability Initiative*, April 5, 2021.

<https://accountabilityindia.in/blog/understanding-problem-driven-iterative-adaptation-and-its-limitations/>.

¹⁷ Lawson, Andrew, and Jamelia Harris. "Is the Problem Driven Iterative Adaptation Approach (PDIA) a Panacea for Public Financial Management Reform? Evidence from Six African Countries." *World Development Perspectives* 31 (2023): 100526. <https://doi.org/10.1016/j.wdp.2023.100526>.

¹⁸ Hadden, Doug. "Please Don't Mimic PDIA – The Limits of Institutional Reform in Development." *The Limits of Institutional Reform in Development* (blog), November 2014. https://matthewandrews.typepad.com/the_limits_of_institution/2014/11/please-dont-mimic-pdia.html.

¹⁹ Chaffin, Brian C., Hannah Gosnell, and Barbara A. Cosens. "A Decade of Adaptive Governance Scholarship: Synthesis and Future Directions." *Ecology and Society* 19, no. 3 (2014): 56. <https://doi.org/10.5751/ES-06824-190356>.

²⁰ ISSN 0305-750X, Butler, C., & Adamowski, J. (2015). Empowering marginalized communities in water resources management: Addressing inequitable practices in participatory model building. *Journal of Environmental Management*, 153, 153–162. <https://doi.org/10.1016/j.jenvman.2015.02.010>

²¹ Prior, J., Zaw, T. N. N., Hassen, J. Y., & Toperesi, E. (2019). Social capital, adaptation and resilience: Case studies of rural communities in Ethiopia, Zimbabwe and Myanmar. In H. James (Ed.), *Population, Development, and the Environment* (pp. 87–112). Palgrave Macmillan. https://doi.org/10.1007/978-981-13-2101-6_7

²² Macoloo, C., Recha, J., Radeny, M., & Kinyangi, J. (2013). Empowering a local community to address climate risks and food insecurity in Lower Nyando, Kenya. *Hunger, Nutrition, Climate Justice: Putting People at the Heart of Global Development*. Retrieved from <https://www.mrfci.org/wp-content/uploads/2015/09/2013-04-16-Nyando.pdf>

²³ Datta, Anamika W., and Brian C. Chaffin. "Evolving Adaptive Governance: Challenging Assumptions through an Examination of Fisheries Law in Solomon Islands." *Ecology and Society* 27, no. 2 (2022): 30. <https://doi.org/10.5751/ES-13209-270230>.

While formal structures are central to adaptive governance, empirical research shows much of the process unfolds informally. In Indonesia and Greece, urban planners often bypass conventional policy tools, instead relying on dialogue, trust, and diverse networks to tailor inclusive processes.²⁴ Similarly, in Southern African hospitals, health workers used WhatsApp to improvise referral systems, dramatically improving efficiency.²⁵ Papamichail and Peric (2019) argue that informal practices can complement formal planning, especially where conventional tools fail to address complexity and stakeholder conflict. They contend that informality provides a broader spectrum of problem-specific solution, fosters consensus through experimentation, and strengthens stakeholder buy-in, leading to faster, more adaptive outcomes than formal methods. This shift reflects recognition that adaptive governance is shaped not only by formal structures, but by local knowledge, collaboration, and experimentation and is key to flexibility in dynamic, resource-constrained settings.

As adaptive governance research and its associated tools have expanded, so too have critiques, especially regarding its application in developing countries. Though conceptually promising, adaptive governance often requires political will, institutional strength, and collaboration—conditions many developing countries lack, prompting informal governance to fill the gap. Formal structures support policy implementation, but informal networks and local innovation are vital for adaptive responses in fluid contexts. Zhao et al. (2024) map global adaptive governance scholarship, identifying key hotspots and trends. They find developing countries underrepresented, particularly in institutional adaptation and policy innovation but a growing interest in transformative governance: reshaping institutions to address structural inequalities and promote innovation-driven development. This trend reframes innovation policy as a tool for system-wide transformation, not just incremental improvement.

²⁴Papamichail, Theano, and Ana Perić. “Informal Planning: A Tool towards Adaptive Urban Governance.” In Proceedings of the 55th ISOCARP World Planning Congress 2019, edited by Mihaela Juvara and Sabine Ledwon, 1–14. The Hague: International Society of City and Regional Planners, 2019.

²⁵Kapepo, Meke, Jean-Paul Van Belle, and Edda Weimann. “WhatsApp as an Improvisation of Health Information Systems in Southern African Public Hospitals: A Socio-Technical Perspective.” *Procedia Computer Science* 256 (2025): 805–815. <https://doi.org/10.1016/j.procs.2025.02.18>

2.3 National Innovation Systems

The theoretical foundations of National Innovation Systems (NIS) emerge from the post-WWII developmental state tradition, which responded to the inadequacies of neoclassical economics in accounting for long-term technological change and national competitiveness. Gerschenkron (1962) argued that late-industrializing countries like Germany deployed distinct institutional mechanisms, such as development banks and coordinated capital markets, to leapfrog early industrializers.²⁶ Similarly, Freeman (1987), in his study of Japan's post-war rise and innovation success, points out the importance of state-led coordination, targeted support for strategic sectors, and institutionalized learning processes.²⁷ These models emphasized investment in R&D but also the configuration of human capital, regulatory environments, and firm structures as co-evolving systems of innovation. However, it was Lundvall (1992) that provided a more dynamic and interactive conceptualization.²⁸ Lundvall called attention to feedback loops and institutional learning and introduced the idea of innovation as a socially embedded process grounded in learning-by-doing and user-producer relationships: Knowledge is not simply produced by R&D laboratories; it is co-created through continuous interaction across firms, suppliers, consumers, and importantly, institutions.

A year later Nelson (1993) curated a comparative volume of national case studies that focused on the structural differences in institutional design and their impacts on innovation capacity, including variations in university-industry relationships and public R&D funding.²⁹ His work demonstrated the institutional variety of innovation systems and emphasized that no universal institutional blueprint guarantees innovation success, which conceptually expanded the significance of the university system and public science institutions for national competitiveness.

Teixeira (2008) observes that such foundational contributions have led to conceptual fragmentation within NIS theory, which now evolves along two distinct intellectual traditions: the U.S. "science and technology" tradition, centered on formal R&D and technological frontier

²⁶ Gerschenkron, Alexander. *Economic Backwardness in Historical Perspective: A Book of Essays*. Cambridge, MA: Belknap Press of Harvard University Press, 1962

²⁷ Freeman, Christopher. *Technology Policy and Economic Performance: Lessons from Japan*. London: Pinter Publishers, 1987

²⁸ Lundvall, Bengt-Åke, ed. *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers, 1992

²⁹ Nelson, Richard R., ed. *National Innovation Systems: A Comparative Analysis*. New York: Oxford University Press, 1993.

activity, and the European “interactive learning” tradition, emphasizing social capital, institutions, and embedded learning.³⁰ These diverging paths produce distinct theoretical emphases and policy orientations—Nelson’s narrower focus on formal R&D institutions contrasts with Lundvall’s broader inclusion of non-market and experiential learning processes. However, for Metcalfe (1995, 2005), innovation policy should move beyond correcting market failures to addressing “systems failures,” such as weak linkages, fragmented learning, and inadequate institutional support for experimentation.^{31,32} This evolutionary systems perspective views innovation systems as dynamic constellations of interacting agents shaped by routines, feedback, and institutional context. Edquist (1997) encapsulates this functional view, defining NIS as comprising “all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations.”³³ Edquist (1997) also calls to broaden the NIS framework to include non-technological and non-R&D forms of innovation, especially in service sectors and identified six key functions of an NIS:

³⁰ Teixeira, Aurora A. C. “National Systems of Innovation: A Bibliometric Appraisal.” *FEP Working Papers* no. 271 (April 2008). https://www.researchgate.net/publication/24111655_National_Systems_of_Innovation_a_bibliometric_appraisal.

³¹ Metcalfe, J. Stanley. “Technology Systems and Technology Policy in an Evolutionary Framework.” *Cambridge Journal of Economics* 19, no. 1 (1995): 25–46.

³² Metcalfe, J. Stanley. “Systems Failure and the Case for Innovation Policy.” In *Innovation Policy in a Knowledge-Based Economy: Theory and Practice*, edited by Patrick Llerena and Mireille Matt, 47–74. Berlin: Springer, 2005.

³³ Edquist, Charles, ed. *Systems of Innovation: Technologies, Institutions and Organizations*. London: Pinter Publishers, 1997.

Key Functions of a Well-Performing National Innovation System (Adapted from Edquist, 1997)		
Key Function	Description	Relevance to NIS Framework
Provision of Research and Development (R&D)	Ensuring the generation of new knowledge through basic and applied scientific.	Freeman (1987) and Nelson (1983) emphasized RSD as central to technological advancement and institutional learning within national systems.
Formation of New Product Markets	Creating and nurturing markets for innovative goods and services, including demand side policies and reg-	Lundvall (1992) highlighted the role of institutions in standard setting as vital for aligning technological innovation with broader societal goals.
Articulation of Quality Requirements	Establishing standards, norms, and benchmarks to guide and align innovation outputs with societal and industrial needs.	Edquist (1997) underscored inter-active learning and knowledge flows across institutional boundaries as foundational to the NIS framework.
Creation and Diffusion of Knowledge	Promoting knowledge exchange between actors through formal and informal channels (e.g., university-industry linkages, networks).	Lundvall (1992) and Edquist (1997) noted that institutional support for capital allocation fasters strategic investment in innovation systems
Provision of Capital for Innovation	Ensuring the availability of financial resources (public and private) to support innovation across development stages.	Early recognition of entrepreneurship as a key vehicle for translating knowledge and institutional support into applied innovation.
Support for Entrepreneurship	Encouraging entrepreneurial activity as a means of commercializing innovation and diffusing new ideas into	Early recognition of entrepreneurship as a key vehicle for translating innovation.

(Table 1: Author's own table)

This pragmatic systems view links innovation to policy cycles while emphasizing policy design, institutional adaptability, and networked governance, framing innovation systems as comprising formal bodies alongside policies, regulations, and soft infrastructures that support learning and technological change. The OECD's 1999 report *Managing National Innovation Systems* operationalized NIS, translating theory into policy guidance and offering a widely cited schematic..³⁴Teixeira (2008) later adapted the model to show innovation capacity as emerging from interactions among education, macroeconomic conditions, markets, infrastructure, and global networks. At its core, the model places the firm within a knowledge network, supported by institutions that regulate and foster innovation. These networks rest on socio-political foundations like norms, legal frameworks, and trust. Innovation here is not linear but an emergent property of dynamic system interactions. The diagram also crucially illustrates links between regional and global systems, showing national innovation as porous and shaped by cross-border knowledge and institutions.

³⁴ Organisation for Economic Co-operation and Development (OECD). *Managing National Innovation Systems*. Paris: OECD Publishing, 1999

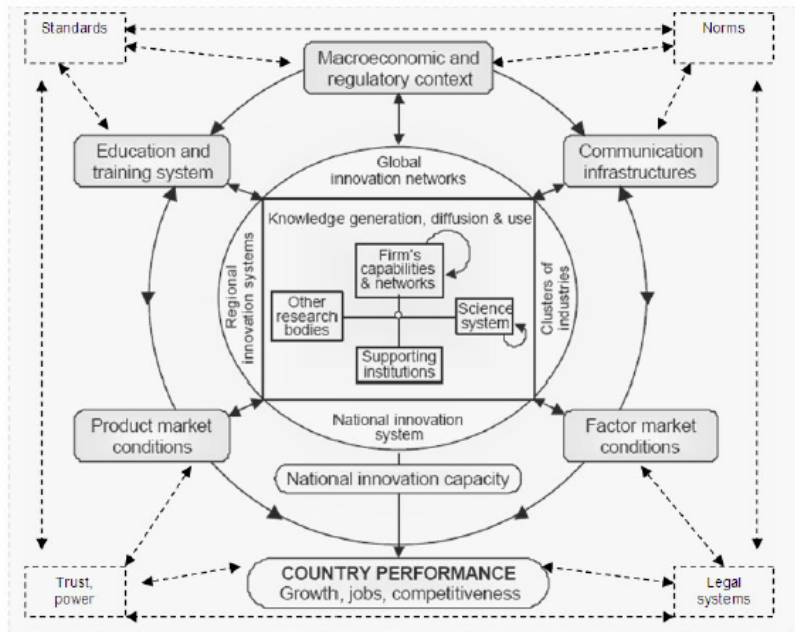


Figure 1: The NSI: a schematic overview

(Diagram 3 OECD (1999); Teixeira (2008) NIS Schematic Overview)

Soete, Verspagen, and ter Weel (2009) refine the NIS framework into four core nodes: human capital investment, applied research, spatial proximity among actors, and absorptive capacity.³⁵ This shifts the NIS focus from institutional actors to functional components, processes, and innovation-enabling capacities. These domains also reflect the structural foundations of a nation's capacity to generate and absorb innovation. Alongside Teixeira (2008), they argue that NIS research underrepresents Global South contexts, R&D internationalization, service-based innovation, and digital technologies—calling for a move beyond OECD-centric models. Additionally, Soete et al (2009) caution that the dynamics of the 21st century demand attention to cross-border flows of information, capital, and expertise in addition to knowledge generation and absorption. While the Quadruple Helix model has sought to account for new actors like media, civil society, and the global network, its integration into NIS theory remains partial.³⁶ What is also missing in literature is the importance of social capital across income contexts, despite evidence linking strong networks to higher innovation. An analysis of 102 European regions found that high social capital correlates with greater investment in risky, knowledge-intensive

³⁵ Soete, Luc L. G., Bart Verspagen, and Bas J. ter Weel. *Systems of Innovation*. UNU-MERIT Working Paper Series No. 2009-06. Maastricht: United Nations University, 2009

³⁶ Carayannis, Elias G., and David F. J. Campbell. *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems*. New York: Springer, 2012.

innovation, especially where informal networks aid experimentation.³⁷ This supports Lundvall and Soete et al.'s view that innovation systems are also fundamentally social and relational.

“Innovation as a socially embedded process” invites a rethinking of how policy is formulated and adapted over time. Institutional approaches such as Jann and Wegrich (2017) structure innovation governance around iterative policy cycles that include *(i)agenda-setting,(ii) formulation, (iii)decision-making, (iv) implementation, and (v)evaluation* creating multi-phase processes of learning, adjustment, and institutional feedback.³⁸ These cycles underpin adaptive governance models that prioritize flexibility and responsiveness. The contemporary perspectives emphasize ideal innovation policy as experimental, inclusive, and rooted in interactive, multi-actor learning processes. From the literature, dominant clusters can be identified, as the historiographical overview below synthesizes:

³⁷ Akçomak, I. Semih, and Bas ter Weel. “Social Capital, Innovation and Growth: Evidence from Europe.” *European Economic Review* 53, no. 5 (2009): 544–567. <https://doi.org/10.1016/j.euroecorev.2008.10.001>

³⁸ Jann, Werner, and Kai Wegrich. “Theories of the Policy Cycle.” In *Handbook of Public Policy Analysis: Theory, Politics, and Methods*, edited by Frank Fischer, Gerald J. Miller, and Mara S. Sidney, 69–88. Boca Raton, FL: CRC Press, 2017.

Thematic Synthesis on NIS Literature (Early Foundations to 2024)			
<i>National Innovation Systems evolved from institutionally anchored, state-led models focused on R&D and industrial policy to dynamic, socially embedded frameworks emphasizing interactive learning, social capital, and adaptive governance in a globalized context.</i>			
Time Period	Key Authors	Key Developments	Theoretical Orientation
1950s–1970s	Gerschenkron (1962), Johnson (1982), Amsden (1989)	Foundations of the developmental state; role of government in industrial policy; institutional learning emerges as a concept.	Developmental State Systems
1980s	Nelson	Shift toward evolutionary and institutional economics; criticism of neoclassical innovation models.	Evolutionary-Institutional Models
Late 1980s–Early 1990s	Freeman (1987), Lundvall (1992), Nelson (1993)	Emergence of the National Innovation Systems (NIS) concept; Japan as a model of coordinated innovation policy.	Interactive Learning Systems
1990s–2000s	Edquist (1997), Metcalfe (1995, 2005), OECD (1999)	Expansion of NIS into comparative studies and practical application; emphasis on interactive learning, institutions, and systemic failures.	Systemic and Comparative Models
2000s–2010s	Teixeira (2008), Soete et al. (2009), Akcomak & ter Weel (2009)	Research application of NIS in developing countries; rise of ‘systems failure’ theory; social capital and informal institutions emphasized.	Adaptive, Socially Embedded Systems
2010s–2024	Carayannis & Campbell (2012), Crowley et al. (2020)	Globalization of innovation systems; regional and global NIS concepts; Quadruple Helix and inclusivity debates.	“Glocalized”, Adaptive Socio-Technical Systems

(Table 2: Author’s own table)

Though widely adopted, the innovation “system” concept is unevenly applied, diluted by overlapping terms and contextual reinterpretations.

Nonetheless the literature has developed from descriptive institutional mappings to dynamic analyses of innovation policy. Today, NIS frameworks reflect “glocalized,” adaptive socio-technical systems shaped by national policy, transnational flows, local absorption, and networks of trust and capability. As systems become more adaptive and decentralized, focus

shifts to micro-level choices, resource negotiation, and local strategies that foreground agency, resourcefulness, and emergent innovation under constraint.

2.4 Effectuation

Effectuation theory departs sharply from rational-choice, goal-driven models of entrepreneurship. Sarasvathy (2001), drawing on cognitive science, advances a logic of action that leverages available means rather than prediction. She argues that think-aloud studies with expert entrepreneurs show success arises from iteratively co-creating the future using present resources, networks, and contingencies, not from forecasting markets. In this way, Effectuation uniquely treats uncertainty as a resource to shape and co-produce, not merely minimize.

At the heart of effectuation are 5 core principles: bird-in-hand (leveraging existing identity, knowledge, and networks); affordable loss (acting within acceptable downside); crazy quilt (co-creating with self-selected stakeholders); lemonade (treating surprises as resources); and being the “pilot in the plane” to steer direction. These heuristics suit contexts with low goal clarity, market predictability, and institutional reliability which are conditions typical of start-ups and, as this thesis argues, developing-state innovation policy. Sarasvathy and Dew (2002) responded to early misinterpretations by clarifying that effectuation does not oppose rationality—it broadens it.³⁹ They frame effectuation as a socially embedded logic in which outcomes emerge from commitments, interactions, and co-created trajectories not linear optimization. They found that expert entrepreneurs let goals evolve through engagement with means and stakeholders, instead of maximizing against a predefined goal. This opens conceptual space for understanding innovation not only as a strategic pursuit but as an iterative social process as demonstrated in this thesis author’s own hypothetical example below:

³⁹ Dew, Nicholas, and Saras D. Sarasvathy. “What Effectuation Is Not: Further Development of an Alternative to Rational Choice.” Paper presented at the Academy of Management Conference, Denver, 2002

Effectuation in Practice: An Example of Adaptive Entrepreneurial Action

A novice entrepreneur, equipped with basic programming knowledge, limited expandable savings, and access to a network of local creatives, initiates the development of a community events application. Without securing external funding or formulating detailed predictive plans, she constrains her initial investment to a manageable loss threshold [Affordable Loss]. She invites willing collaborators from her personal and professional circles and incrementally expands her project's capabilities and reach through self-selected partnerships [Crazy Quilt]. As user feedback unexpectedly highlights a greater demand for neighborhood security alerts over event coordination, she strategically pivots the app's focus [Lemonade]. Throughout the process, she leverages her existing means—her skills, savings, and social network—to guide decisions and shape opportunities [Bird-in-Hand]. Rather than relying on market predictions or competitive analysis, she believes her own actions will shape the future of the venture [Pilot-in-the-Plane]. This sequence of actions—leveraging immediate means, operating within affordable loss boundaries, co-creating with stakeholders, and capitalizing on unanticipated developments—illustrates the core processes that define effectual entrepreneurship.

(author's own example)

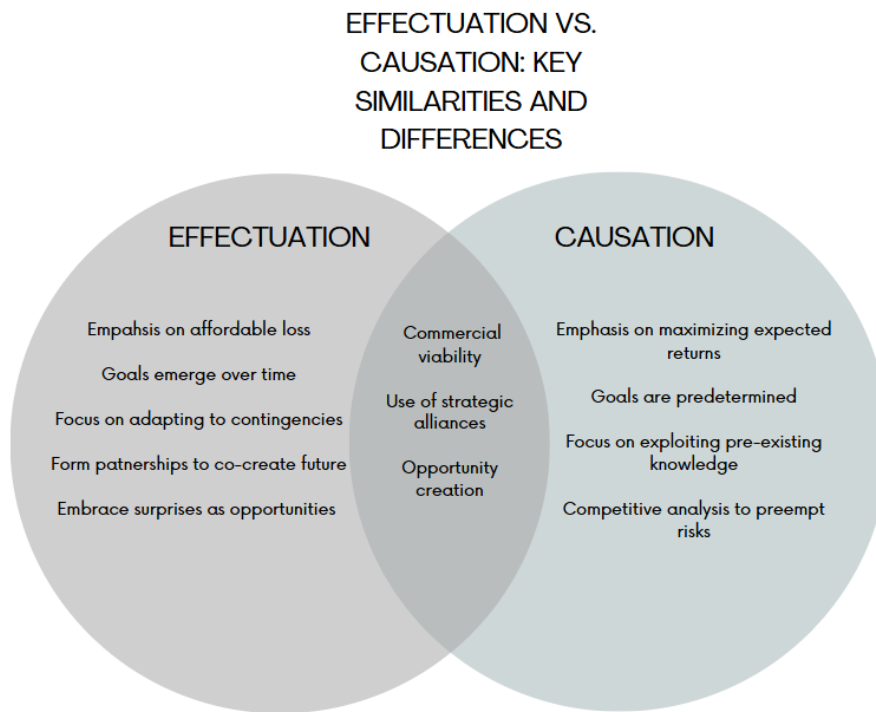
In Witbank et al. (2009), Sarasvathy later recasts effectuation as “constrained creativity,” melding systematic action with adaptive resourcefulness.⁴⁰ The study empirically traces effectual logic within angel investing. Findings show seasoned angels favor entrepreneurs who align stakeholders and flexibly shape opportunities, relying on control-oriented effectual logic over prediction amid high uncertainty.

Later studies sought to operationalize effectuation empirically. Chandler et al. (2011) created Likert-scale measures of effectuation and tested them with 1,200 nascent entrepreneurs.⁴¹ They found that leveraging contingencies and experimentation correlate strongly with innovation under high uncertainty. However, the study also revealed overlap with causal reasoning. For example, stakeholder pre-commitment, the “crazy quilt” principle, correlated with formal planning. This blurring of boundaries suggests that entrepreneurs often move fluidly between effectual and causal logics. RReymen et al. (2015) bolster this hybrid view with a longitudinal

⁴⁰ Witbank, Robert, Stuart Read, Nicholas Dew, and Saras D. Sarasvathy. “Prediction and Control under Uncertainty: Outcomes in Angel Investing.” *Journal of Business Venturing* 24, no. 2 (2009): 116–133. <https://doi.org/10.1016/j.jbusvent.2008.02.00>

⁴¹ Chandler, Gaylen N., DeTienne, Dawn R., McKelvie, Alexander, and Mumford, Troy V. “Causation and Effectuation Processes: A Validation Study.” *Journal of Business Venturing* 26, no. 3 (2011): 375–390. <https://doi.org/10.1016/j.jbusvent.2009.10.006>

study of expert entrepreneurs.⁴² They observed innovators toggling between the two logics in response to investment stages, pivots, and external shocks. Effectuation thus forms part of a broader cognitive toolkit, dynamically shaped by learning, feedback, and institutional demands. These findings support a processual rather than prescriptive reading of effectuation when compared to Causation:



(Diagram 4. Author's own diagram)

Yet expansions of effectuation theory face critique. Arend, Sarooghi, and Burkemper (2015), using the 3E framework (explanation–empirics–elegance), question effectuation's coherence and scope.⁴³ They contend its boundary with causation is vague and that its insights may not generalize beyond entrepreneurship. Specifically, they doubt effectuation suits macro-level policy unless power asymmetries, structural inertia, and regulatory complexity are addressed. Their critique is not dismissive; rather, they call for refinement via frameworks that integrate institutional embeddedness and structural dynamics.

⁴² Reymen, Isabelle M. M. J., Andries, Petra, Berends, Hans, Mauer, René, Stephan, Ute, and van Burg, Elco. "Understanding Dynamics of Strategic Decision Making in Venture Creation: A Process Study of Effectuation and Causation." *Strategic Entrepreneurship Journal* 9, no. 4 (2015): 351–379. <https://doi.org/10.1002/sej.1201>

⁴³ Arend, Richard J., Sarooghi, Hessamoddin, and Burkemper, Andrew. "Effectuation as Ineffectual? Applying the 3E Theory-Assessment Framework to a Proposed New Theory of Entrepreneurship." *Academy of Management Review* 40, no. 4 (2015): 630–651. <https://doi.org/10.5465/amr.2014.0455>

with Brettel et al. (2012) attempted to scale Effectuation to test impact on R&D performance across 153 German manufacturing firms.⁴⁴ TFlexibility and means orientation strongly predicted innovation success, particularly under high uncertainty. However, the affordable-loss principle helped only in especially volatile environments. These findings underscore that effectuation is not a one-size-fits-all strategy but a context-sensitive logic that thrives where uncertainty and complexity preclude long-term planning. Louise Gilding (2021) offers a valuable, realistic policy practitioner perspective.⁴⁵ Drawing on senior public-service experience, she shows policy is crafted, negotiated, and implemented on the fly. One vivid example concerns a social housing initiative launched before finalization of its operational architecture. Gilding's team relied heavily on preexisting networks and iterative problem-solving to navigate the uncertainty, (the bird-in-hand and crazy quilt principles). Such "policy on the run" echoes Sarasvathy's means-driven, stakeholder co-creation logic amid unpredictable policy windows.

Gilding's case was buffered by high-capacity institutions and ample resources that cushioned experimentation. Risks escalate sharply in lower-capacity contexts. Coyoli (2021) offers a contrasting perspective during Mexican education-reform. Mid-level bureaucrats, constrained by fragmentation and narrow mandates, built grassroots initiatives through trust networks and informal coalitions. Lacking formal authority, they achieved system change via cumulative micro-actions. But Coyoli notes that, without institutional scaffolding, effectual improvisation can yield uneven or regressive results.

So Effectuation offers a powerful description of entrepreneurial action under uncertainty, but its translation to macro-level governance remains incomplete. Its flexibility and co-creation aid low-resource settings, but they require frameworks ensuring learning, accountability, and inclusion.

Although much of innovation literature focuses on high-capacity states, the utility of effectuation becomes clearer in countries like Rwanda and Vietnam. Both countries have demonstrated means-driven, coalition-based innovation that resonate with Sarasvathy's principles and entrepreneurial strategies under institutional flux, fiscal scarcity, and pressing developmental

⁴⁴ Brettel, Malte, Mauer, René, Engelen, Andreas, and Küpper, Daniel. "Corporate Effectuation: Entrepreneurial Action and Its Impact on R&D Project Performance." *Journal of Business Venturing* 27, no. 2 (2012): 167–184

⁴⁵ Gilding, Louise. "Effectuation in Public Policy: A Practitioner's Reflection." *Australian Journal of Public Administration* 80, no. 2 (2021): 259–263. <https://doi.org/10.1111/1467-8500.12456>

imperatives. Yet their practices also reflect strategic statecraft, cultural dynamics, and global partnerships, extending beyond entrepreneurial improvisation.

3. Methodology

3.1 Research Design and Comparative Strategy

This study uses an interpretive comparative method, positioning Rwanda and Vietnam as innovation-emerging, resource-constrained cases. It sees innovation governance as arising from interdependent actors, institutions, and policy tools, driven by latent mechanisms such as incentives, norms, and stakeholder dynamics that ultimately shape outcomes.

Combining *document analysis with cross-national benchmarking*, the methodology identifies (i) each country's policy sequencing and adaptation over two decades and (ii) how dominant innovation governance frameworks are interpreted, localized, and adapted by state actors under constraint.

3.2 Case Selection

Rwanda and Vietnam were purposely chosen as lower- or middle-income states that climbed the Global Innovation Index (GII) despite institutional fragility and scarce resources. Both countries have demonstrated sustained commitments to national innovation through flagship policies, reform and science and technology development strategies. However, their histories, governance, and stakeholder ties diverge, inviting cross-case analysis of alternative institutional paths to similar results. Such variation is leveraged to advance theory through comparison.

3.3 Data Collection Methods

Two primary sources of data are used:

1. Document Analysis: Government strategy documents, national development plans, legislative texts, donor reports, and statistical yearbooks from both countries provide a baseline for understanding formal policy intent, implementation modalities, and reported outcomes. International indexes such as the Global Innovation Index, UNESCO science reports, and World Bank education and R&D indicators are used for triangulation and benchmarking.

2. **Comparative Indicators:** To assess innovation policy over time and across cases, indicators were chosen for relevance to the study's analytical dimensions. Where available, standardized metrics such as R&D intensity, higher education enrollment, ICT penetration, and entrepreneurship activity were used to complement narrative and institutional analysis. These indicators were selected for broad acceptance in the literature and consistent availability for Rwanda and Vietnam over the study period. When data were sparse or uneven, indicators contextualized rather than ranked the cases. The goal was to anchor narrative insights in observable trends, allowing for an integrated and evidence-informed interpretation of policy evolution.

3.4 Analytical Framework

The analysis progresses from system mapping to governance evaluation, entrepreneurial logic, and cross-framework synthesis to explain innovation in resource-constrained settings. Selected frameworks are applied across institutional foundations, governance dynamics and adaptive capacity, Effectuation as strategy under constraint, and outcomes synthesis for framework alignment. Overall, the study blends comparative and case evidence to show how both nations overcome structural limits to spur innovation-led growth.

3.4.1 Institutional Foundations: Mapping the National Innovation System

Building on NIS and core Rwandan and Vietnamese policy texts, this section applies OECD- and Lundvall-based lenses to analyze each country's innovation foundations. It spotlights human-capital investment, applied R&D, market coordination, and policy networks with an aim to underscore how structural legacies and early investments have shaped the systemic coherence of each country's innovation ecosystem. Selected policies include:

Vietnam: The legacy of Doi Moi (1986–present) as the enabling institutional shift, followed by targeted initiatives including the Strategy for Science and Technology Development (2001–2010), the Master Plan on the National Innovation System (2013–2020), and the National Digital Transformation Program (2020–2025).

Rwanda: The foundational trajectory will be anchored in *Vision 2020 (2000–2020)*, complemented by the *NICI Plans (2000–2020)*, the *National Science, Technology and Innovation Policies (2005, 2020)*, and the forward-looking *Vision 2050*.

3.4.2 Governance Dynamics and Adaptive Capacity

Adaptive capacity is assessed with the ACW and PDIA, highlighting iterative learning under constraint. PDIA assessment tracks policy iterations, local problem-solving, and feedback use in key reforms and local programs. The six ACW dimensions rely on qualitative–quantitative composites triangulated from reports, policy reviews, and global metrics. Scores were calibrated with a structured 1–5 rubric, anchoring each dimension to national goals and peer benchmarks:

- 1 = Weak or absent capacity
- 2 = Emerging or inconsistent presence
- 3 = Moderate capacity with evidence of functionality
- 4 = Strong and institutionalized capacity
- 5 = Exemplary or above globally recognized practice

While the scores are interpretive, all judgments are traceable to source material included in the thesis. The radar charts are used as synthesized diagnostic visualizations to provide comparative insight into adaptive governance features in the ACW.

Governance dynamics will be marked by top-down strategic control, bottom-up experimentation or some combination through policies including:

Vietnam: The *Socio-Economic Development Strategy (2011–2020)* will be treated as a strategic umbrella under which various innovation policies were aligned. Emphasis will also be placed on *Resolution No. 52-NQ/TW (2019)* and the launch of the *National Innovation Center* as adaptive pivots in digital innovation policy.

Rwanda: Governance coherence will be examined through the evolution of *EDPRS I & II* (2008–2018), the *Smart Rwanda Master Plan* (2015–2020), and the integrative logic of the *Seven-Year Government Program* (2010–2024).

3.4.3 Effectuation as Strategy under Constraint

This section applies the Effectuation framework to explore how actors in resource-limited contexts co-create innovation outcomes through iterative experimentation, leveraging available means and partnership-driven action. It highlights micro-level improvisation and bottom-up dynamics that complement top-down institutional efforts. The cases will be assessed for evidence of effectual principles such as leveraging existing means, forming strategic partnerships, and embracing contingency at the central government level and identify instances of local entrepreneurial logic, risk-sharing, and learning-by-doing as manifestations of effectual strategy.

3.4.4 Outcomes Synthesis and Framework Alignment

The final analytical layer synthesizes outcomes across both countries using a mix of qualitative insights and quantitative indicators. It aligns these findings with the three theoretical frameworks to distill lessons on innovation under constraint. Attention will be paid to shifts in governance logic, coordination structures, and stakeholder roles and wpoints of convergence and divergence, testing the explanatory utility of dominant frameworks and highlighting areas where theory falls short.

3.5 Methodological Limitations

While this study seeks to offer a detailed, multi-theoretical analysis of innovation governance in Rwanda and Vietnam, several methodological limitations must be acknowledged:

1. Data Availability and Reliability

Access to accurate, comparable, and comprehensive data especially innovation-related indicators in resource-constrained economies remains limited. Statistical discrepancies, differing definitions of innovation inputs and outputs, and missing data constrain the ability to conduct quantitative

comparisons. In particular, metrics such as R&D spending, patent filings, and startup counts may underrepresent informal or non-traditional forms of innovation common in these settings.

2. Comparability Across Contexts

While both countries are classified as resource-constrained economies, they differ in size, political structure, development history, and integration into global markets. These contextual differences complicate direct comparisons, especially when applying frameworks like National Innovation Systems or Adaptive Governance.

3. Framework Integration Complexity

The integration of three distinct analytical frameworks is intended to enhance theoretical depth and interpretation. These frameworks operate at different levels (systemic, institutional, and entrepreneurial), which may lead to overlap or tension in categorizing or drawing cross-framework conclusions.

4. Policy-Centric Focus

This study emphasizes formal policies and state-led initiatives, which may bias the analysis toward top-down innovation dynamics. While Effectuation is used to capture bottom-up processes, informal or community-driven innovation may remain underexplored due to limited documentation and challenges in accessing non-institutional data sources.

5. Temporal Scope

The analysis spans over two decades (2000–2024), relying heavily on retrospective evaluation of national strategies and policies which can lead to hindsight bias, especially when interpreting policy effectiveness or attributing causality.

6. Limited Field-Based Validation

Due to resource and time constraints, this study does not include extensive fieldwork or stakeholder interviews in Rwanda or Vietnam. As such, it relies predominantly on secondary

data sources like policy documents, global indices, and academic literature. These may not fully capture the lived realities or dimensions of innovation policy implementation.

4. The Rwandan Case

4.1 From Reconstruction to Innovation

The 1994 Genocide against the Tutsi triggered near-total institutional collapse in Rwanda. One million deaths decimated the population, halted governance, ruined infrastructure, and shattered public trust. What's more, GDP shrank 11.4 %, worsening an already fragile economy where half the civil service was executed or exiled, leaving an institutional void and a skills drain.⁴⁶⁴⁷

By 2000, extreme poverty hit 64 %, life expectancy fell to 29, and under 5 % of households had water or electricity.⁴⁸⁴⁹⁵⁰ Human capital was severely depleted: adult literacy stood at 50% in 1991⁵¹, and much of the education infrastructure was destroyed or abandoned during the conflict.⁵² Under these conditions, Rwanda was heavily donor dependent, with foreign aid constituting 94% of GDP.⁵³ As a result, Rwanda emerged from the genocide with some of the weakest human, administrative, and institutional capacities in the world. The challenge was not simple reconstruction but re-creating a state amid fragmentation, distrust, and crisis. Since then, strong central leadership, rapid institutional rebuilding, and vision-driven innovation have powered Rwanda's recovery. In fact, Behuria (2020) sees Rwanda's developmentalism as pragmatically ideological and historically contingent.⁵⁴ Eschewing classic industrial policy, Rwanda empowered a technocratic elite to drive Vision2020 (and successor Vision2050), prioritizing human capital, digital infrastructure, and sector coordination. To do so, it paired unity-and-self-reliance narratives with neoliberal tactics, using state intervention to attract

⁴⁶ International Monetary Fund, *The Development Path Less Traveled: The Experience of Rwanda*, Departmental Paper No. 20/02 (Washington, DC: International Monetary Fund, 2020), <https://www.imf.org/-/media/Files/Publications/DP/2020/English/DPLTEREA.ashx>

⁴⁷ *ibid*

⁴⁸ Paul Nimusima, *Rwanda Economic Performance Overview: A Review of Post-Genocide Economic Recovery* (Jönköping, Sweden: Jönköping University, 2018), <https://ju.se/download/18.243bd3a4161b08d5c5817099/1520578293273/EARP-EF%202018-17%20Nimusima.pdf>

⁴⁹ Bertelsmann Stiftung. *BTI 2024 Country Report — Rwanda*. Gütersloh: Bertelsmann Stiftung, 2024. <https://bti-project.org/en/reports/country-report/RWA>

⁵⁰ World Bank. (2011). *Scaling up electricity access: The case of Rwanda*. Washington, DC: World Bank <https://openknowledge.worldbank.org/entities/publication/5c644f08-7927-5a01-90af-1c1522a53071>

⁵¹ World Bank, "Literacy rate, adult total (% of people ages 15 and above) – Rwanda," accessed May 6, 2025, <https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?locations=RW>

⁵² ReliefWeb. "Rwanda Schools Still Struggling to Recover from 1994 Genocide." *ReliefWeb*. March 13, 2006. <https://reliefweb.int/report/rwanda/rwanda-schools-still-struggling-recover-1994-genocide>.

⁵³ Mary Atta-Dakwa, *Aiding to Repair: An Analysis on the Impact of Foreign Aid in Rwanda After the 1994 Genocide* (Collegeville, PA: Ursinus College, 2018), 7, https://digitalcommons.ursinus.edu/int_hon/3/

⁵⁴ Behuria, Pritish. 2020. "Development and Developmentalism in Post-Genocide Rwanda." In *Democracy and Development in Africa*, edited by J. Grugel, S. P. Khan, and M. Larizza, 123–142. Singapore: Springer. https://doi.org/10.1007/978-981-13-2904-3_6

private capital and global legitimacy. Thus, policy tools doubled as levers for political stabilization and state re-legitimation.

Rwanda's "strategic governance under constraint" has defied post-conflict and orthodox development scripts to survive scarcity and weak institutions. In many ways, it recast innovation as a pragmatic response to conflict-driven poverty, fragile infrastructure, and donor dependence, not a developed-economy luxury. Since 2000, it has blended systemic coordination, adaptive institutional logic, and entrepreneurial improvisation to produce results that include: rising human development and innovation outputs, improved governance indicators, and growing international recognition and competitiveness. However, the country's innovation journey is far from linear, and critical gaps still exist between ambition, implementation, and impact associated with innovation ecosystems.

4.2 Mapping Institutional Foundations in Rwanda's National Innovation System

Rwanda's National Innovation System (NIS) did not emerge organically from a mature research ecosystem or a globally competitive industrial base. Instead, it was slowly built through an intentional state-driven visioning process rooted in post-conflict reconstruction.

Vision 2020

Launched in 1999, Vision 2020 sought to shift Rwanda from subsistence to a knowledge-based, middle-income economy.⁵⁵ It offered a long-term blueprint for economic and innovation transformation, emphasizing human capital, infrastructure, governance, and technology. Vision 2020 also included an ambitious set of socio-economic targets that served as directional indicators for Rwanda's innovation, displayed below.

⁵⁵ Republic of Rwanda. *Vision 2020*. Kigali: Ministry of Finance and Economic Planning, 2000

Table 5: Key economic variables of the Vision 2020

	2005	2010	2015	2020
Population (Million)	8.65	9.88	11.29	12.90
Population growth rate	2.7%	2.7%	2.7%	2.7%
Nominal GDP (Billion)	1,218.75	2,147.85	3,957.28	7,291.04
GDP Growth Rate	7%	8%	9%	9%
GDP per Capita (Rwf)	140,915.87	217,369.10	350,540.18	565,298.46
GDP per Capita (USD)	231.39	336.48	542.63	875.08
Agriculture(billion)	560.63	923.58	1,582.91	2,376.88
Agriculture (%of GDP)	46%	43%	40%	33%
Services (Billion)	439	795	1,504	3,048
Services (% of GDP)	36%	37%	38%	42%
Industry (Billion)	219	430	871	1,867
Industry (% of GDP)	18%	20%	22%	26%
Gross Domestic Investment (GDI)	321.75	614.29	1,131.78	2,085.24
Public	124.19	163.26	314.35	605.25
Private	197.56	451.02	817.44	1,479.99
Gross Domestic Investment (GDI) % of GDP)	26%	29%	29%	29%
Public	10%	8%	8%	8%
Private	16%	21%	21%	20%
Total Capital Expenditure	124.19	163.26	314.35	605.25

(Diagram 1: Anticipated/planned projections included in Vision 2020)

Among its key projections were to raise literacy from 48% in 2000 to 85% by 2020, increase GDP per capita from \$290 to \$900, and extend life expectancy from 49 to 55 years. Vision 2020 anticipated NIS notions of systemic, institutionally embedded, multi-actor innovation by identifying six pillars and three cross-cutting areas—one being Science and Technology.

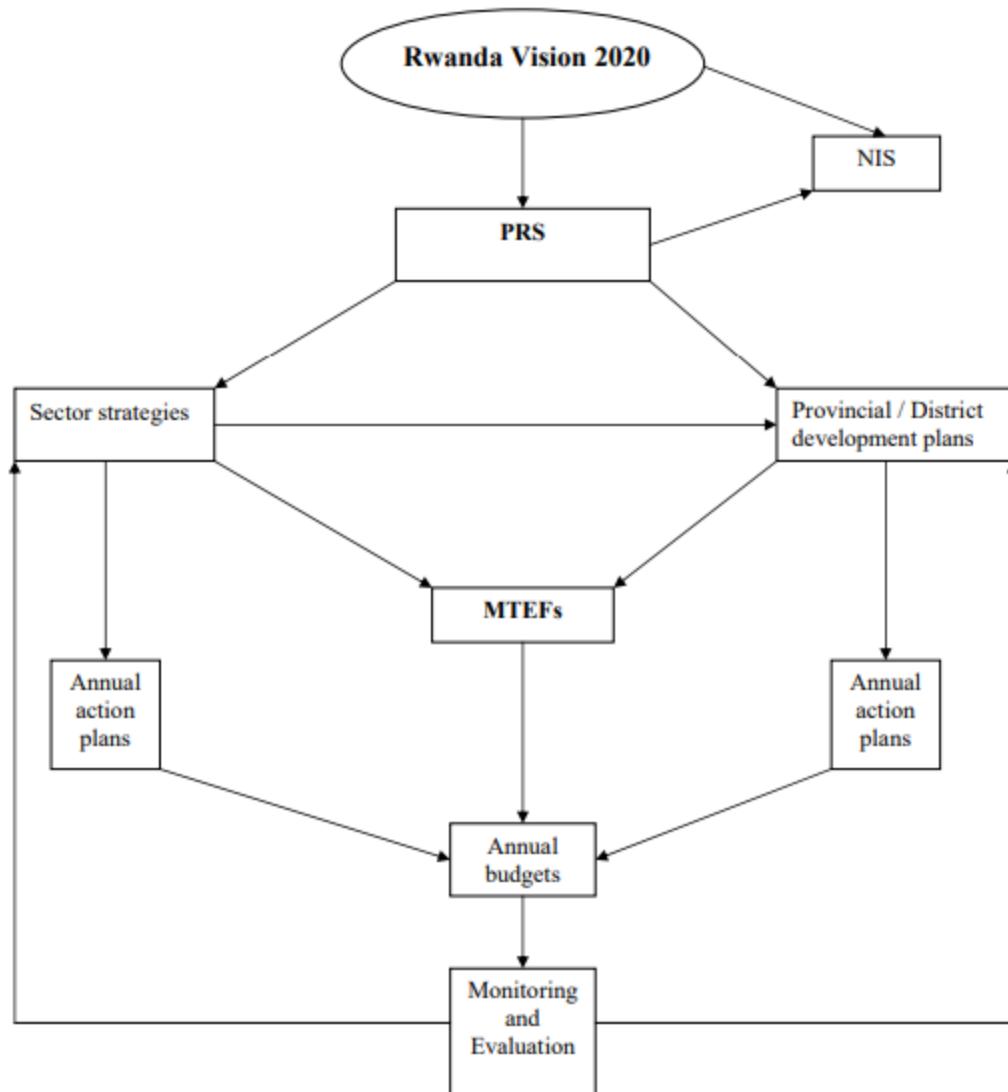
Table 3: Pillars of the VISION 2020 and its crosscutting areas

Pillars of the VISION 2020	Cross-cutting areas of VISION 2020
1. Good governance and a capable state	1. Gender equality
2. Human resource development and a knowledge based economy	2. Protection of environment and sustainable natural resource management 3. Science and technology, including ICT
3. A private sector-led economy	
4. Infrastructure development	
5. Productive and Market Oriented Agriculture	
6. Regional and International Economic integration.	

(Table 1: Pillars of Vision 2020 (Vision 2020))

The Vision 2020 document also included a planning model to show the coordination of long-term innovation and development goals through iterative, nested planning instruments:

Figure 2: Converting Vision 2020 into a reality



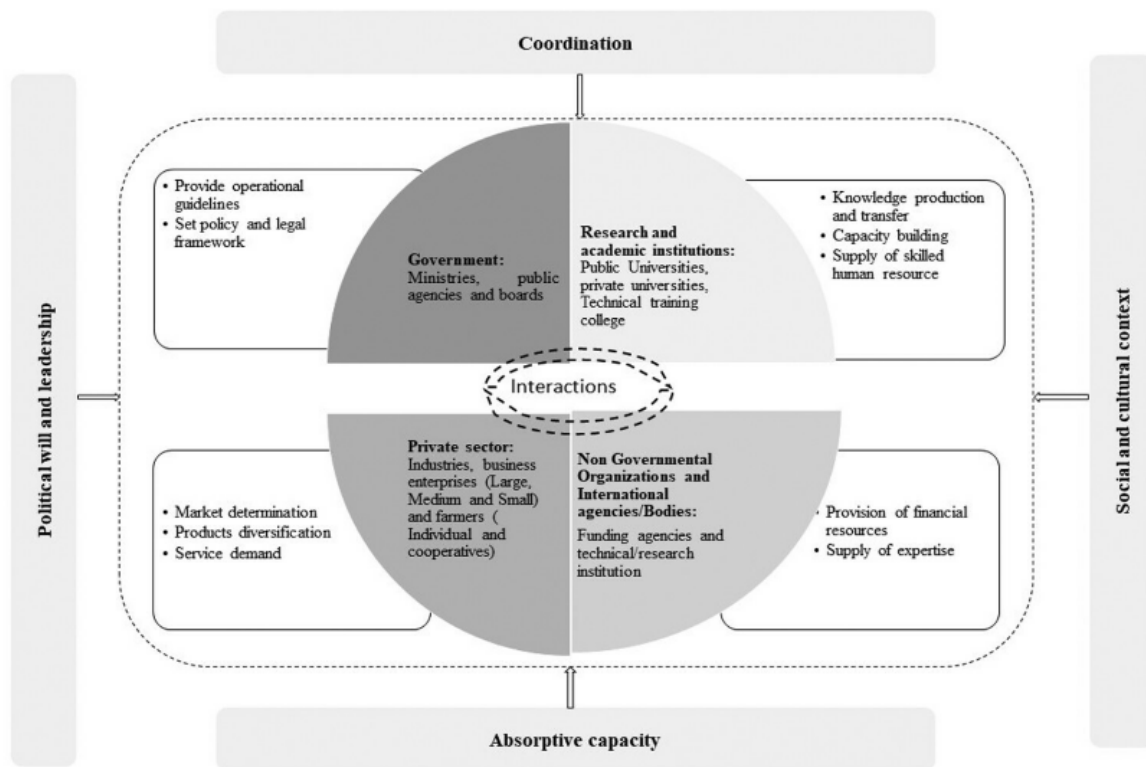
(Diagram 2: Converting Vision 2020 into a reality planning model (Vision 2020))

1. **Poverty Reduction Strategy (PRS)** – the first mid-term strategy focused on human development and macroeconomic stabilization.
2. **National Investment Strategy (NIS)** – aimed at aligning capital investment with long-term goals.

3. **Sector and district development plans**, which were harmonized through **Medium-Term Expenditure Frameworks (MTEFs)** and annual public investment programs.
4. **Annual action plans** emerge from both sectoral and local plans, guiding yearly activities, which are financed through annual budgets. The entire process is supported by a robust **Monitoring and Evaluation (M&E)** mechanism to ensure accountability, assess impact, and provide feedback for continuous improvement

There is a clear layered design of the planning process that reflects an adaptive system in which strategy, resource allocation, evaluation, and policy adjustment operate in reinforcing cycles. These feedback connections align with NIS frameworks in that they attempt to institutionalize policy learning, although primarily through strong state steering. The logic of state-led coordination is made even more explicit in Yongabo and Göransson's (2020) schematic layout of Rwanda's National Innovation System, where the government is centrally positioned as both regulator and orchestrator of innovation processes.⁵⁶

⁵⁶ Yongabo, Parfait, and Bo Göransson. "Constructing the National Innovation System in Rwanda: Efforts and Challenges." *Innovation and Development* 12, no. 1 (2020): 1–22. <https://doi.org/10.1080/2157930X.2020.1846886>.



(Diagram 3: Yongabo and Göransson's Rwanda NIS (2020))

Here, government serves as central coordinator, setting laws, steering strategy, and funding—while research institutes supply knowledge and skilled labor. The private sector generates demand and products, while NGOs and international bodies bridge financial and technical gaps. At the core of this system lies interaction, key to translating isolated activities into systemic innovation. At the bottom, absorptive capacity represents the ability of firms, individuals, and public bodies to internalize, adapt, and utilize knowledge and technology effectively.

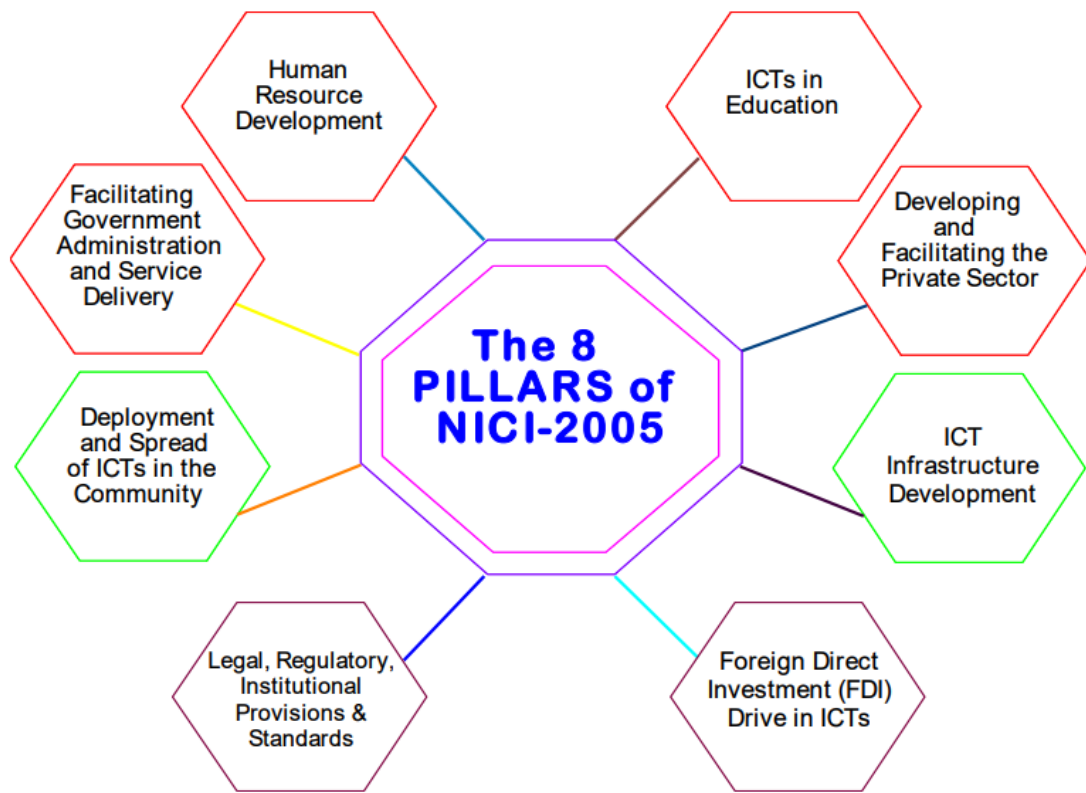
The framework stresses political will and socio-cultural context, showing reliance on central guidance over decentralized dynamism. This aligns with Rwanda's broader developmental state plans, where centralized planning meets targeted knowledge production and capacity-building. However, the model also recognizes that technical solutions alone are insufficient. Institutional trust, local learning, and responsive policy bolster human capital, collaboration norms, and openness to innovation.

The National Information and Communication Infrastructure Policies (NICIs), NICI I (2000–2005), NICI II (2006–2010), and NICI III (2011–2015) represent sequential national ICT policies that served as implementation arms of Vision 2020. These policies carried two functions: provide a structured national ICT development trajectory as a catalyst for innovation, and institutionalize innovation across sectors using digital infrastructure.

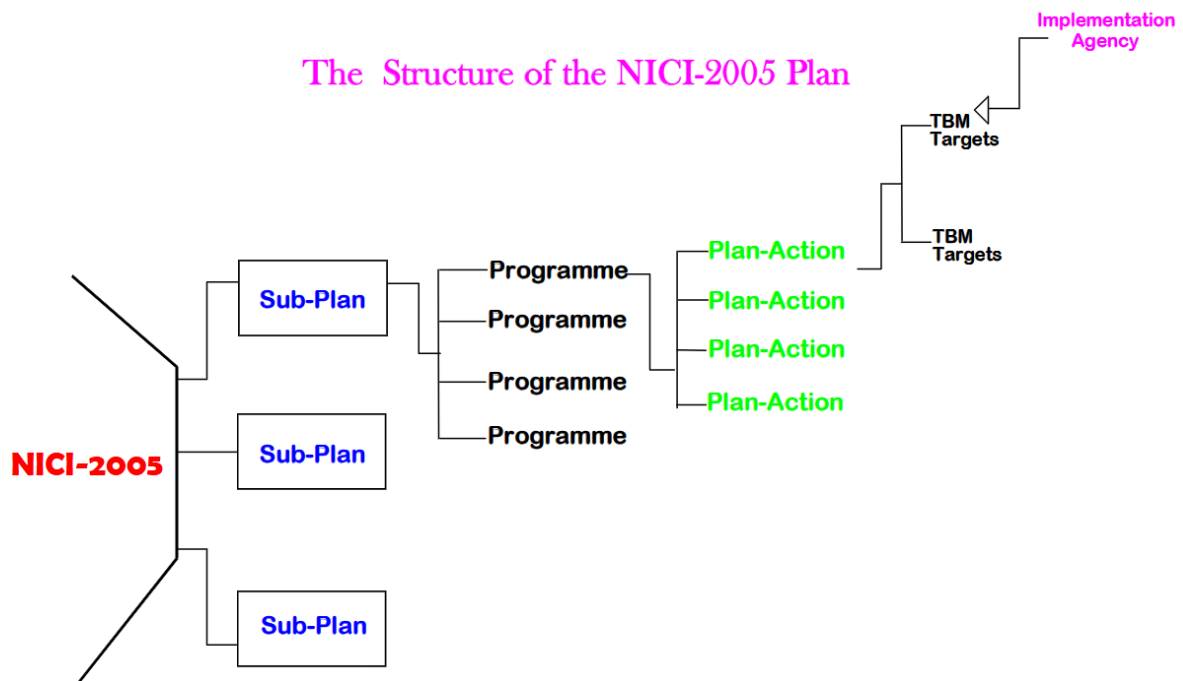
NICI I (2000-2005)

Drafted amid severe institutional fragility, the first NICI followed Vision 2020.⁵⁷ It was the first strategic attempt to place ICT at the development core, using digital tools to offset post-conflict governance and economic deficits. NICI I's eight pillars focused on building ICT capacity in education, public services, legal frameworks (e.g., RITA), infrastructure, FDI attraction, and community access. While the plan was ambitious, it is a relatively underdeveloped framework for orchestrating national digital transformation. As seen in the structural diagrams below, the architecture is highly segmented, cascading from broad sub-plans into discrete programmes and then into fragmented plan-actions.

⁵⁷ Republic of Rwanda. *National Information and Communication Infrastructure (NICI) Plan 2005*. Kigali: Ministry of Infrastructure, 2000.



(Diagram 4: Pillars of NICI 2005)



(Diagram 5: Structure of NICI 2005)

The pillar layout highlights domains over coordination, showing early ICT policy as blueprint-driven not adaptive. This illustrates a young governance system still acquiring feedback-driven, iterative capacity design with goals for institutional readiness and public-sector modernization. Disruptive innovation would be the next phase.

NICI II (2006–2010)

NICI II went beyond installing infrastructure to building systemic integration and connecting ICT with multisectoral transformation. The ICT infrastructure built in NICI I now became the conduit for institutional coordination, public-private partnerships, and capacity development. Ten pillars were attached with a detailed implementation matrix with objectives, timelines, lead institutions, performance indicators, and budgets. The MINICT (Ministry of ICT) oversaw policy and alignment; RITA managed technical rollout; and line ministries and local governments implemented ICT applications relevant to their mandates (e.g., Ministry of Health digitizing health records). Overarching, a multisector National Steering Committee ensured

alignment, accountability, and stakeholder participation.

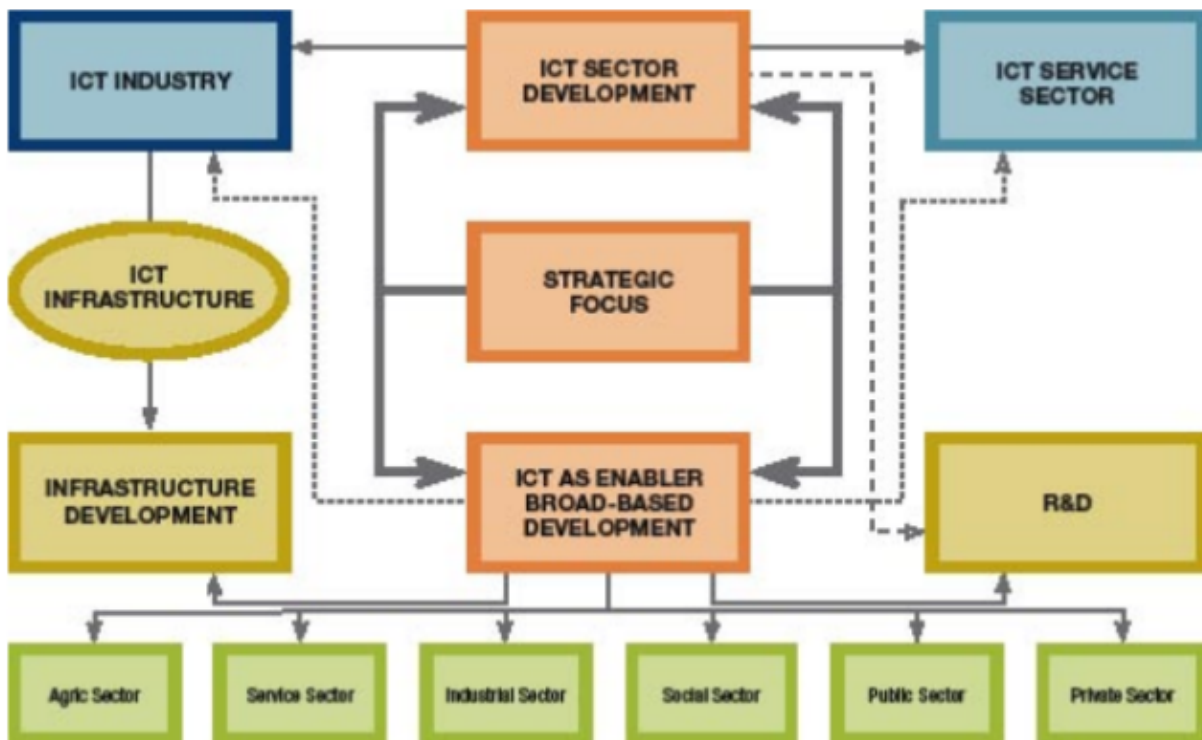


Figure 4: NICI II Framework

(Diagram 6: NICI II Framework)

NICI II employed a coordinated, multi-stakeholder strategy to embed ICT across every governance and development sector. Central to this architecture was the adoption of Sector-Wide Approaches (SWAs), which required every ministry to mainstream ICT, horizontally integrating digital priorities in education, health, agriculture, and more. To maintain momentum and accountability, Annual Action Plans accompanied structured M&E frameworks, which tracked progress using key performance indicators aligned with its ten strategic pillars. This phase also relied heavily on donor coordination and public-private partnerships (PPPs) and collaborating with the World Bank and UNDP, alongside telecom companies and technology investors to co-finance and co-implement core initiatives. With NICI, the government began to shift innovation policy from linear inputs to interactive systems thinking with policies around ICT having a dual focus: (i) As a sector (e.g., R&D, service delivery, infrastructure) and (ii) As an enabler of development across agriculture, industry, education, and governance.

Figure 2: The Dual Focus of the NICI process



(Diagram 7: NICI II Dual Focus)

For Rwanda's NIS, NICI II solidified linkages between the Government, research institutions, and private sector, while its rural and legal inclusion efforts reinforced the enabling environment (social context and absorptive capacity).

NICI III (2011-2015)

The third NICI iteration shifted towards service-oriented ICT development. NICI III was markedly more sophisticated in both content and execution. It was also the first ICT strategy that formally connected to the idea of a knowledge-based society. NICI III emphasized the delivery of tangible services through ICT. This meant not just building systems but embedding them in public service ecosystems. Its visuals show a move from broad, thin plans to five focused pillars:

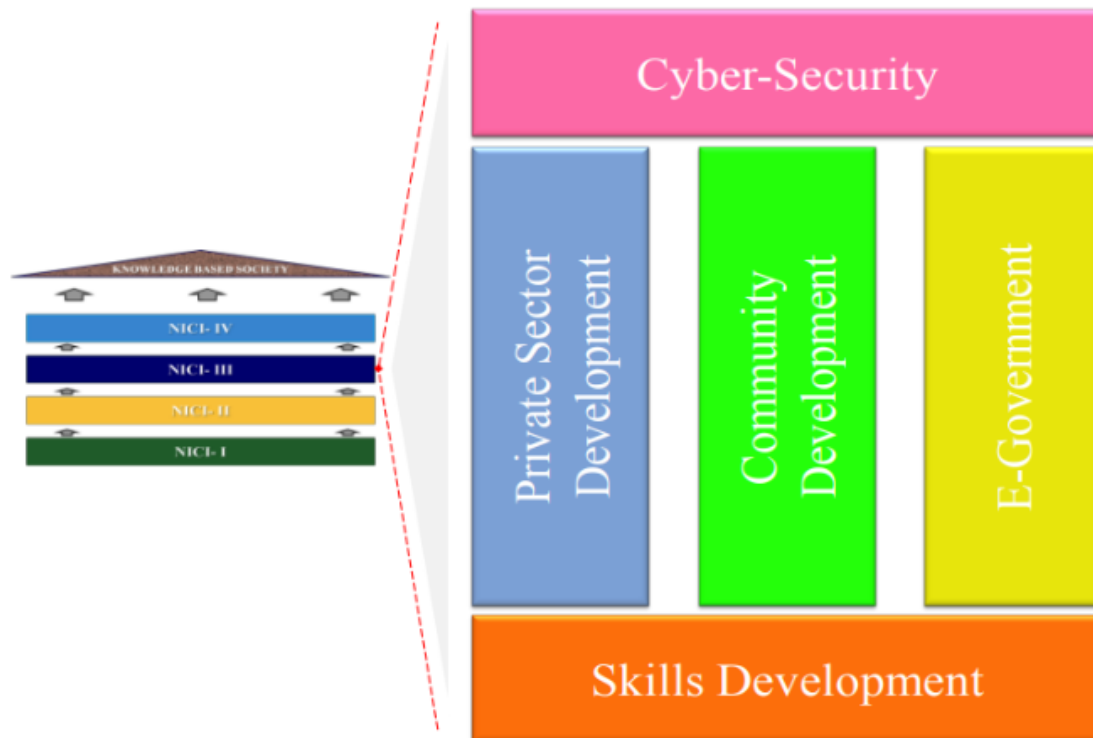


Figure 5: NICI III Framework

(Diagram 8: NICI III Framework)

Each pillar contains sub-frameworks, as demonstrated in the e-Government architecture figure below:

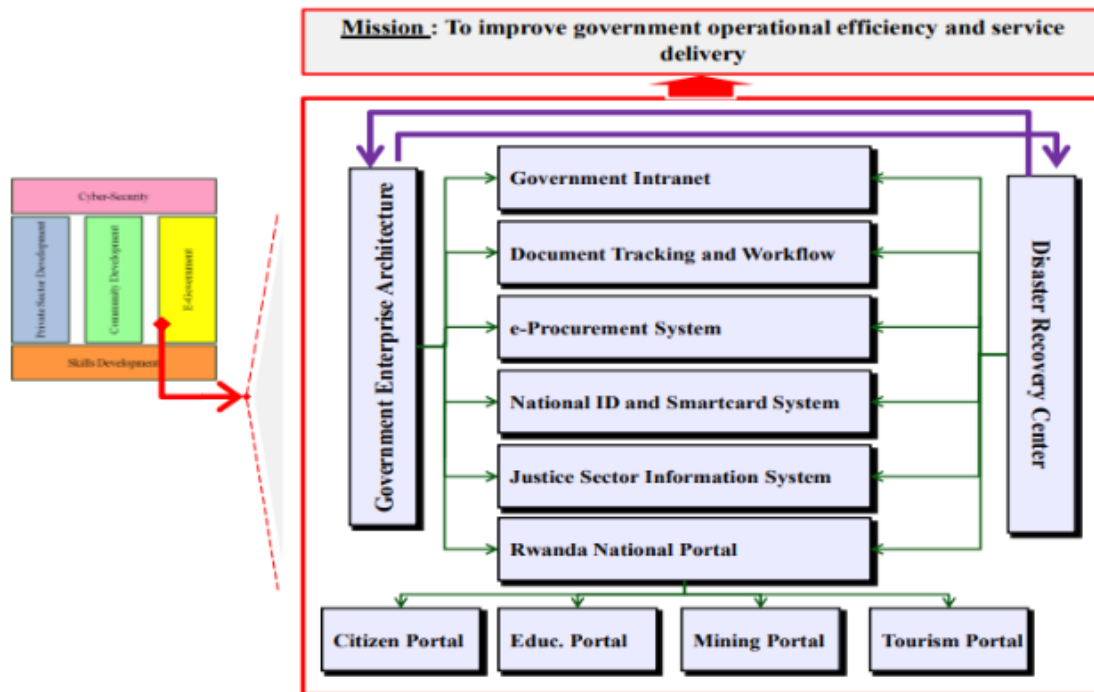


Figure 9: e-Government Projects

(Diagram 9: NICI III E-government)

These figures show that NICI III marked a decisive turn toward building system-wide connectivity, moving from moving from ICT as infrastructure to ICT as governance and service delivery. Unlike NICI I–II’s pilots, NICI III rolled out full e-government including document tracking and workflow systems. But through its Community Development pillar, it also helped bridge the digital divide. NICI III piloted ICT hubs, tech-enabled agriculture, and local-language content for farmers, health workers, and traders. ICT champions within communities were also introduced to foster peer learning and social diffusion. Additionally, NICI III was also the first plan to embed cybersecurity as a central development priority in response to emerging digital threats to Rwanda’s e-service provision.

Another signal of government process innovation change through the third NICI was the government’s move beyond solely state-led infrastructure development and began actively involving private sector actors in the co-creation and implementation of innovation initiatives.

Regulatory facilitation: Government provided the legal frameworks and land or infrastructure, private actors brought in capital and technical expertise; *Strategic visioning:* NNICI III cast the partnerships as integral to Rwanda's move toward a knowledge-based, digital economy; *Incubation support:* PPP-seeded hubs such as kLab trained coders, digital entrepreneurs, and developers.; and *ICT Sector Strategy Synergy:* NICI III tied these initiatives to the ICT Sector Strategy (2013–2018), which prioritised private-led innovation. So while still centrally coordinated, the third NICI plan began laying the groundwork for decentralized innovation activity and stakeholder collaboration and in doing so represents a maturing NIS.

Since NICI III, Rwanda has boosted absorptive capacity through entrepreneur-and-engineer training, opened academia–industry–government diffusion channels, fostered interactive learning, and broadened actors to startups, accelerators, and foreign VC. The comparative table below demonstrates the institutional maturity in the evolution of Rwanda's innovation system from a vertical, state-led model to a horizontal, ecosystem-based model with notable implications for governance dynamics:

NICI I-III Comparison			
Dimension	NICI I (2000–2005)	NICI II (2006–2010)	NICI III (2011–2015)
Primary Focus	Foundational ICT infrastructure, policy and institutions	Sector-wide integration of ICT	Governance innovation, cybersecurity, entrepreneurship
Pillars	8 (e.g., human resources, legal frameworks, FDI, service delivery)	10 (education, e-gov, rural access, legal, social transformation)	5 (+ sub-frameworks: cyber, community, e-gov, private sector, skills)
NIS Integration	Built initial infrastructure and state capacity	Connected sectors and promoted inclusive access	Introduced system-wide coherence and partial decentralization
Governance Style	Centralized, blueprint-driven	Hybrid coordination	Strategic orchestration with sectoral autonomy
NIS Enablers	Infrastructure & legal design	Capacity-building & integration	Security, entrepreneurship, digital service ecosystem

(Table 2: Author's own table)

4.3 Governance Dynamics and Adaptive Capacity

Beyond ICT strategies, decentralization reforms also boosted Rwanda's adaptive governance capacity. The 2000 National Decentralization Policy restructured districts and established grassroots units with decentralized planning, budgeting, and monitoring.⁵⁸ This decentralization allowed local level officials to assume more participatory roles in local planning and oversight and transformed. By 2015, 30% of Rwanda's national budget was channeled through districts and multiple revenue streams for districts were introduced: block grants (LABSF), earmarked

⁵⁸ Semina, Naima, and Dahana Bachir. "Decentralization Reform in Rwanda: A Study of Achievements and Challenges." *Journal of Law and Sustainable Development* 12, no. 12 (2024): 1–18. <https://doi.org/10.55908/sdgs.v12i12.4235>.

grants, capital grants, donor funds, and own-source revenue. Services became 81% more accessible, 75% faster, 73% more affordable and 76% more reliable. Over 54% of citizens accessed key services in just one visit and 72% of surveyed citizens believed decentralization increased participation in public services.

Chapter 2 framed adaptive governance as a decentralized approach to managing uncertainty, marked by multi-actor engagement, iterative adaptation, and the integration of feedback mechanisms across governance networks. The concept centers around governance as an evolving learning system, responsive to performance signals, stakeholder input, and shifting socio-economic conditions. Both the Adaptive Capacity Wheel (ACW) and PDIA look at governance learning not only in terms of outcomes, but also in their internal structures, decision-making logic, and learning processes. In Rwanda, decentralization and evolving NICI plans exemplify adaptive governance and bespoke capacity building. Each successive NICI phase explicitly built on prior lessons and gaps. But NICI plans ran in sync with Vision 2020 with the state as both catalyst and regulator of innovation. In fact, every NICI was shaped by Rwanda's four-year strategies, starting with PRSP I (2002–2006) focused on stabilization, poverty relief, and institutional repair. Under EDPRS I (2008–2012), which stressed economic transformation and private-sector growth, NICI II scaled national ICT infrastructure. EDPRS II (2013–2018) then prioritized urbanization, services, and innovation, mirrored by NICI III's shift to demand-driven e-services and inclusive entrepreneurship.

This embeddedness demonstrates incredible coordination and tight feedback for adaptive governance. Annual leadership retreats (Umwiyerero) which began in 2003 as platforms for policy reflection, correction, and accountability and performance contracts (Imihigo), citizen report cards, and governance scorecards were used to enforce decentralized delivery of national goals.

Moreover, the National Strategy for Transformation 1 (2017-2024) and the Smart City Master Plan represent natural extensions of the NICI vision for a renewed digital economy agenda.⁵⁹ As

⁵⁹ Ministry of ICT and Innovation, Republic of Rwanda. *Smart City Rwanda Master Plan*. Kigali: Government of Rwanda, 2019.

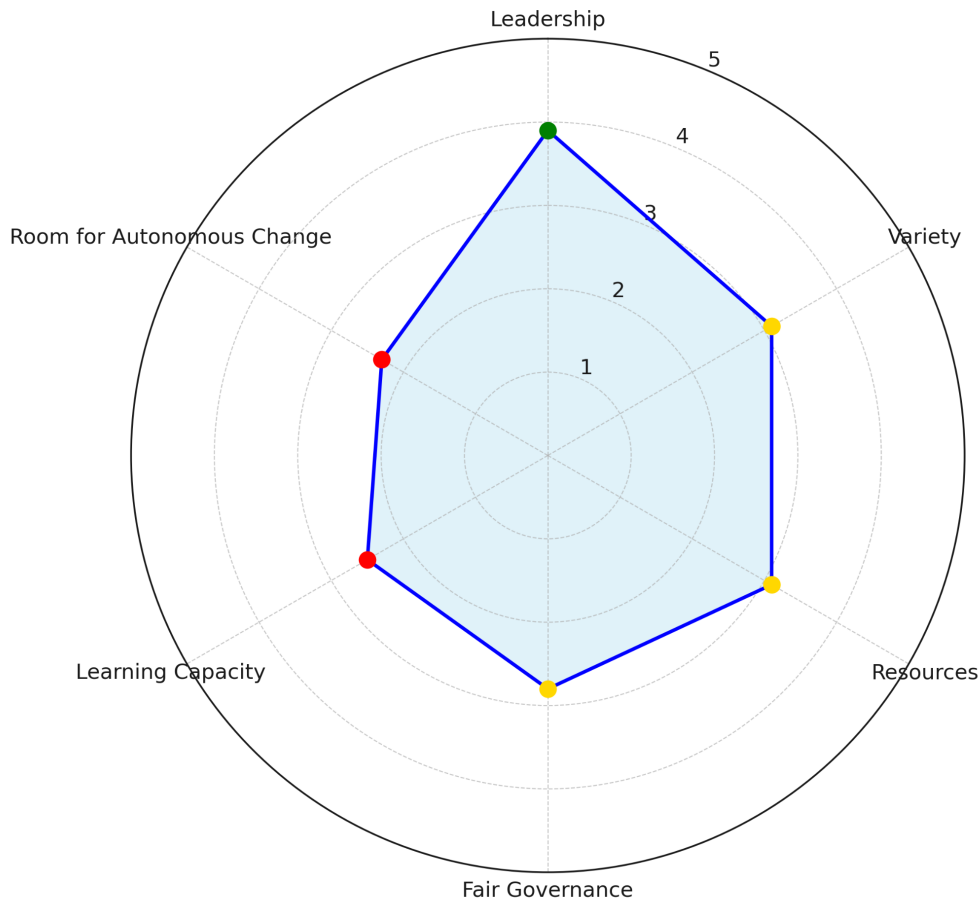
https://www.minict.gov.rw/fileadmin/user_upload/minict_user_upload/Documents/Strategies/Smart_City_Rwanda_Masterplan.pdf

Vision 2050 takes up the mantle from Vision 2020, these became key operational pillars with ambitious targets that include 100% digital ID penetration for all Rwandans, 95% 4G coverage, 60% of services fully digitized across ministries and local governments and 1,000 new tech-based jobs annually, especially targeting youth and women. Programs under the plans include IremboGov 2.0 to streamline digital public services, the Digital Ambassadors Program to scale grassroots digital literacy, and Smart Education/Smart Health initiatives that integrate ICT across schools and health facilities. These programs prompt a closer look at the institutional capacities enabling or limiting their impact. The following section applies the Adaptive Capacity Wheel to explore precisely that.

4.3.1 Evaluating Rwanda's Adaptive Capacity through the ACW

The Adaptive Capacity Wheel highlights how Rwanda's ICT governance, while still facing notable constraints, has incrementally developed key institutional features that support adaptive, evidence-informed policymaking. The radar chart below provides a visual summary of Rwanda's ACW-based governance profile, illustrating how different dimensions contribute to or constrain the country's capacity for adaptive innovation.

Adaptive Capacity Profile: Rwanda



(Chart 1: Author's own Radar Chart)

The **variety (2.5)** dimension is one of Rwanda's most interesting capacities. The state's willingness to adopt diverse strategies across different NICI phases demonstrates a healthy degree of problem framing and solution diversity although there is limited institutional variety. NICI I created Rwanda's ICT governance architecture, spawning RITA to handle regulation, coordination, and strategy. It boosted ICT awareness via pilots like SchoolNet and Telecentres and aimed to link universities to global research networks through RwEdNet.⁶⁰ These ICT experiments exposed structural issues in connectivity and technical capacity prompting NICI II to prioritize the national fiber-optic backbone and community ICT centers in rural areas. In this

⁶⁰ Republic of Rwanda, Ministry of Infrastructure. *National Information and Communication Infrastructure (NICI) Plan for Rwanda 2001–2005*. Kigali: Government of Rwanda, 2000.
https://www.itu.int/en/ITU-D/Cybersecurity/Documents/National_Strategies_Repository/Rwanda%20NCSS%20NICI_III.pdf

period, Rwanda invested in a 2,300 km of fiber optic cable, connecting all 30 districts and significantly enhancing internet connectivity.⁶¹ As a result, mobile subscribers (from 42,000 in 2000 to 3.5 million in 2010) and internet users (1,200 in 2000 to 493,900 in 2010) increased exponentially. Rwanda also improved ranking in the World Bank's Ease of Doing Business index during this time from 143rd in 2009 to 67th in 2010 as the government embraced digital systems into public administration architecture.⁶² Responding to demand for service-oriented applications and private-sector engagement, NICI III scaled e-government via Irembo, nurtured ICT entrepreneurship through local hubs, and launched market tools such as e-Soko for real-time farm prices.⁶³ These strategies can be connected to Rwanda's growing strategic pluralism for multi-actor, multi-level participation.

As a result of the trust in government by Rwandans (over 90% express high trust in government institutions⁶⁵), the country excels at **learning capacity (4.2)**. Across NICI cycles, the government practices double-loop learning, revisiting assumptions and reframing goals. Annual Umwiherero retreats and Imihigo contracts institutionalize this learning, tying performance reviews to future plans and local targets. Feedback from these mechanisms then influence subsequent strategy design. For example, to address capacity deficits in implementing its Vision 2020, Rwanda created or restructured four capacity-building bodies (2005-2016) each responding to institutional learnings. The most recent, the Capacity Development and Employment Services Board (CESB) more adequately integrated planning for human capital, employment, and governance performance.⁶⁶ The government has also promoted innovation alongside parallel investment in user-facing systems and local innovation. Situated on a 61-hectare site within Kigali's Special Economic Zone, Kigali Innovation City (KIC) is a \$2 billion public-private

⁶¹ Nsengimana, J.P. Reflections upon periclitations in privacy: perspectives from Rwanda's digital transformation. *Health Technol.* 7, 377–388 (2017). <https://doi.org/10.1007/s12553-017-0196-0>

⁶² World Bank. *Doing Business 2011: Making a Difference for Entrepreneurs*. Washington, DC: World Bank, 2010. <https://openknowledge.worldbank.org/handle/10986/2549>.

⁶³ Mukamurenzi, Solange. *Evaluation for Improving eGovernment in Least Developed Countries*. Örebro: Örebro University School of Business, 2016. <https://www.diva-portal.org/smash/get/diva2:1360880/FULLTEXT02.pdf>.

⁶⁴ Twizeyimana, Jean Damascene. *E-Government and Value Creation in the Context of a Least Developed Country: A Perspective on Public Value and Information Infrastructure*. Örebro Studies in Informatics 16. Örebro: Örebro University, 2019. <https://www.diva-portal.org/smash/get/diva2:1360880/FULLTEXT02.pdf>

⁶⁵ Rwanda Governance Board. 2022. *Rwanda Governance Scorecard (RGS), 9th Edition*. Kigali: Rwanda Governance Board. Accessed 2023. https://e-ihuriro.rcsprwanda.org/wp-content/uploads/2023/06/RGS_9th_Edition.pdf

⁶⁶ African Capacity Building Foundation (ACBF). *Africa Capacity Report 2019: Focusing on Capacity Dimensions of Inclusive Growth*. Harare: ACBF, 2019. <https://elibrary.acbfact.org/acbf/collect/acbf/index/assoc/HASH0186/cdb86059/125042cc/b079.dir/ACR%202019%20Eng%20Final.pdf>

partnership between the Government of Rwanda and pan-African investment groups and is designed as a mixed-use, master-planned innovation ecosystem.⁶⁷ The development plan includes four world-class universities, including Carnegie Mellon University Africa and the African Leadership University, with plans to accommodate additional universities, research and development facilities, and startup incubators.

Evidently, while Rwanda's governance model is relatively centralized, there has been a slow decentralization of innovation capacity. This also reflects how the country makes room for **room for autonomous change(2.2)**. The 2000 National Decentralization Policy marked a quiet rebalancing of authority, creating some institutional space for local actors to take initiative. Within this evolving governance structure, the state assumed a more facilitative role, enabling new forms of public-private collaboration around entrepreneurship and technological diffusion. MINICT in recent years has launched the Hanga Hubs Initiatives with a mission to support the country's most promising early-stage entrepreneurs. These centers serve as incubators for startups, offering co-working spaces, modern infrastructure and access to digital tools to translate ideas into viable products and services. With a year of its establishment 1000 individuals living outside the capital city had benefited from Hanga incubation programs.⁶⁸ The success of these hubs has spawned HangaPitchfest, Rwanda's flagship startup contest, offering seed funding and investor-corporate networks in agritech, fintech, green tech, and healthtech.

Despite Hanga's success, local governments still lack resources, training, infrastructure, and genuine autonomy. Sabbi and Ndikubwimana (2024) point out that Imihigo performance contracts significantly limit genuine local autonomy and innovation.⁶⁹ Officials often chase central targets over local needs, instrumentalizing decentralization and stifling NIS-level autonomy. Additionally, the revised National Decentralization Policy in 2021 concedes that poor legal harmonization and weak inter-government coordination still impede full decentralization,

⁶⁷ Rwanda Development Board. "The Government of Rwanda, Africa50 and BADEA Break Ground on the Construction of Kigali Innovation City." *Rwanda Development Board*, November 23, 2022.

<https://rdp.rw/the-government-of-rwanda-africa50-and-badea-break-ground-on-the-construction-of-kigali-innovation-city/>.

⁶⁸ European Union Delegation to Rwanda. "New Game-Changing Project to Support Young Entrepreneurs Grow Their Businesses Kicks off in Rwanda." *Delegation of the European Union to Rwanda*, October 25, 2022.

https://www.eeas.europa.eu/delegations/rwanda/new-game-changing-project-support-young-entrepreneurs-grow-their-businesses-kicks-rwanda_en

⁶⁹ Sabbi, M., & Ndikubwimana, J. B. (2024). Innovating *Imihigo*: a decentralisation and indigenous governance mechanism in Rwanda. *Canadian Journal of African Studies / Revue Canadienne Des Études Africaines*, 58(2), 349–373. <https://doi.org/10.1080/00083968.2024.2358138>

even if it avoids labeling centralization a “problem.”⁷⁰ These limitations underscore the importance of **leadership (4.5)** and **fair governance (2.5)** within the ACW. In the framework, **leadership** is understood not simply as positional authority, but as the capacity to steer collective vision, mediate uncertainty, and mobilize adaptive responses across institutional layers.

Rwanda's governance model is often lauded for its strong leadership and commitment to fair governance. The country's post-genocide recovery and rapid modernization have unfolded under the strategic direction of a centralized executive with a structure that is often described as a centralized but performance-oriented technocratic bureaucracy.⁷¹ Since 1994, President Paul Kagame and the ruling Rwandan Patriotic Front (RPF) have positioned central leadership as both the driver and guarantor of national transformation. Kagame's Vision 2020 endorsement has launched an enduring ICT focus, with ongoing rhetoric casting Rwanda as a key shaper of Africa's digital agenda and global tech diplomacy. With Vision 2020, NICI plans, EDPRS frameworks, the National Strategies for Transformation and most recently, Vision 2050, there has been a top down governance style leading to institutional alignment across ministries. Kabera (2022) examines the impact of governance on social and economic development in Rwanda, finding a positive correlation between governance practices and development outcomes.⁷² Similarly, Kalisa & Niyikora (2025) write that people-centred governance in Rwanda has nurtured a culture of accountability and responsiveness within public institutions that is acknowledged through citizen and government worker surveys.⁷³

The RGB's Rwanda Governance Scorecard (RGS) reports strong results across governance pillars. Rule of Law' scored 86.9 % and 'Transparency & Accountability' 85.8 %, signalling firm legal and accountability commitments.⁷⁴ Complementing these findings, the 2024 Ibrahim

⁷⁰ Ministry of Local Government (MINALOC). *National Decentralization Policy: Consolidating Participatory Governance and Promoting Local Development*. Kigali: Government of Rwanda, October 2021.
https://www.minaloc.gov.rw/fileadmin/user_upload/Minaloc/Publications/Policies/NATIONAL_DECENTRALIZATION_POLICY_OCTOBER_2021.pdf

⁷¹ Bertelsmann Stiftung. *BTI 2024 Country Report — Rwanda*. Gütersloh: Bertelsmann Stiftung, 2024.
<https://bti-project.org/en/reports/country-report/RWA>

⁷² Kabera, Samuel. *Impact of Good Governance on Social and Economic Development in Rwanda: A Case Study of Rwanda Governance Board (RGB)*. International Journal of Scientific Research and Management (IJSRM) 10, no. 6 (2022): 3932–3941.
<https://ijsrm.net/index.php/ijsrm/article/view/3932>.

⁷³ Niyikora, Evariste, and Kalisa, Ezechiel. *Reframing Service Delivery through People-Centred Governance: The Role of Citizen Report Cards in Rwanda*. International Journal of Public Policy and Administration 7, no. 1 (2025): 13–28.
<https://www.carijournals.org/journals/index.php/IJPPA/article/download/2659/3075/7582>.

⁷⁴ Rwanda Governance Board (RGB). *Rwanda Governance Scorecard: 8th Edition*. Kigali: RGB, 2022.
https://www.rgb.rw/fileadmin/user_upload/RGB/Publications/RWANDA_GOVERNANCE_SCORECARD-RGS/RGS_8th_Edition.pdf

Index of African Governance (IIAG) places Rwanda 14th out of 54 African countries, with an overall governance score of 58.7 out of 100.⁷⁵ That figure tops the African (49.3) and Eastern Africa (46.8) averages. However, the Bertelsmann Transformation Index (BTI) 2024 acknowledges Rwanda's political stability and low levels of corruption while also noting concerns regarding political freedoms and civil liberties.⁷⁶ The report states that the ruling RPF maintains significant influence over public space and civil society, which can limit political pluralism and the full expression of democratic principles. Rwanda scores 5.29/10 in Governance (42 of 137) but only 3.78 in Political Transformation (94th). This indicates challenges in areas such as political participation, rule of law, and the stability of democratic institutions. The country report notes that while elections are conducted, they often lack competitiveness, and opposition parties face significant hurdles. HRW 2023 records detentions, disappearances, and speech restrictions targeting critics.⁷⁷ Additionally, centralization of decision-making and the growing pressures on local communities to implement centrally promoted programs, raises questions about the sustainability and legitimacy of such reforms. Gaynor (2014)'s interviews finds officials pressed to hit central targets, prioritising metrics over local needs and inclusivity.⁷⁸

So while top-down leadership has been effective in setting ambitious goals and ensuring policy coherence, there are limitations in fostering adaptive leadership at local levels. The Africa Capacity Report 2019 notes that: "Despite the strong political will at the national level, there is a need to build leadership capacities at sub-national levels to ensure effective implementation of development programs and to respond to local challenges"⁷⁹

This reveals the final, yet foundational, pillar of adaptive capacity: the presence of reliable and equitably distributed **resources (3.1)**. Post-genocide, Rwanda steered donor funds into Vision 2020 and NICI, with aid covering 56 % of the 2005 budget. By 2010–2011, it

⁷⁵ Mo Ibrahim Foundation. *Ibrahim Index of African Governance: Rwanda Country Profile*. London: Mo Ibrahim Foundation, 2024.

<https://iiag.online/locations/rw.html>

⁷⁶ Bertelsmann Stiftung. *BTI 2024 Country Report — Rwanda*. Gütersloh: Bertelsmann Stiftung, 2024.

<https://bti-project.org/en/reports/country-report/RWA>

⁷⁷ Human Rights Watch. *World Report 2023: Rwanda*. New York: Human Rights Watch, 2023.

<https://www.hrw.org/world-report/2023/country-chapters/rwanda>

⁷⁸ Gaynor, Niamh. "A Nation in a Hurry: The Costs of Local Governance Reforms in Rwanda." *Review of African Political Economy* 41, no. S1 (2014): S49–S63. <https://doi.org/10.1080/03056244.2014.976363>.

⁷⁹ African Capacity Building Foundation (ACBF). *Africa Capacity Report 2019: Focusing on Capacity Dimensions of Inclusive Growth*. Harare: ACBF, 2019.

<https://elibrary.acbfpact.org/acbf/collect/acbf/index/assoc/HASH0186/cdb86059/125042cc/b079.dir/ACR%202019%20Eng%20Final.pdf>

hovered around 40–42%.⁸⁰ Since then, innovation finance has combined domestic spending, external loans, and PPPs. Tax-to-GDP rose from 10.7 % (2012) to 19 % (2022). The higher tax revenue let Rwanda self-fund 65.7 % of the 2022 budget, cutting aid dependence from 38 % (2012) to 17 % (2022).⁸¹ NST1 projected RWF 441.7 bn, to be funded 59 % publicly and 41 % privately, but actual 2017–20 investment averaged 25 % of GDP, split 45: 55 public-to-private.⁸² Rwanda has continued to mobilize international and domestic resources to invest in forward-looking sectors with a recent \$1 billion concessionary loan agreement with South Korea in 2024 to finance innovative projects in transport, healthcare, and education sectors.⁸³ Via the Rwanda Innovation Fund (with AfDB's US\$25million) and the National Research & Innovation Fund, Rwanda also backs researchers and early-stage fintech, healthtech, and agritech ventures through competitive grants and equity financing. On the other hand, there is little evidence of decentralized fiscal spending. The Governance and Decentralisation Sector Strategic Plan 2024–2029 notes that local governments' own-source revenues rose from \$50 million in 2018/19 to \$72 million 2022/23.⁸⁴ However, disparities in local economic bases mean that revenue generation is uneven across regions. Over 40% of districts depend on central government transfers for more than 80% of their total budgets, highlighting persistent vertical fiscal imbalance. Moreover, districts execute only 85–90 % of budgets, hampered by disbursement delays and limited technical capacity for complex projects.

The limits of Rwanda's chosen top down, centrally executed planning are evident when the ACW is analytically applied. Rwanda is a well-steered but tightly controlled system with selective adaptability. While the country's management of innovation initiatives is efficient and draws on strategic partnerships, inclusion and participatory processes are constrained

⁸⁰ Organisation for Economic Co-operation and Development (OECD). *Development Aid at a Glance: Statistics by Region – Africa, 2012 Edition*. Paris: OECD Publishing, 2012.

<https://www.oecd.org/dac/stats/documentupload/4%20Africa%20-%20Development%20Aid%20at%20a%20Glance%202012.pdf>

⁸¹ African Development Bank. *Country Results Brief: Rwanda – Inclusive Growth through Sustained Reforms and Strategic Investments*. Abidjan: African Development Bank Group, 2023. https://www.afdb.org/sites/default/files/documents/publications/crb_rwanda_en_-_web-v3.pdf

⁸² Rwanda Ministry of Finance and Economic Planning (MINECOFIN). *Rwanda: Financing for Transformation – An Integrated National Financing Framework (INFF) Assessment and Diagnostic Report*. Kigali: Government of Rwanda, 2023.

https://inff.org/assets/resource/rwanda_financing-for-transformation_an-inff-assessment-and-diagnostic-report.pdf

⁸³ Reuters. "Rwanda Secures \$1 Bln Funding Deal with South Korea." July 5, 2024.

<https://www.reuters.com/world/africa/rwanda-secures-1-1bn-funding-deal-with-south-korea-2024-07-05/>

⁸⁴ Ministry of Finance and Economic Planning (MINECOFIN). *Governance and Decentralisation Sector Strategic Plan 2024–2029*. Kigali: Government of Rwanda, 2023.

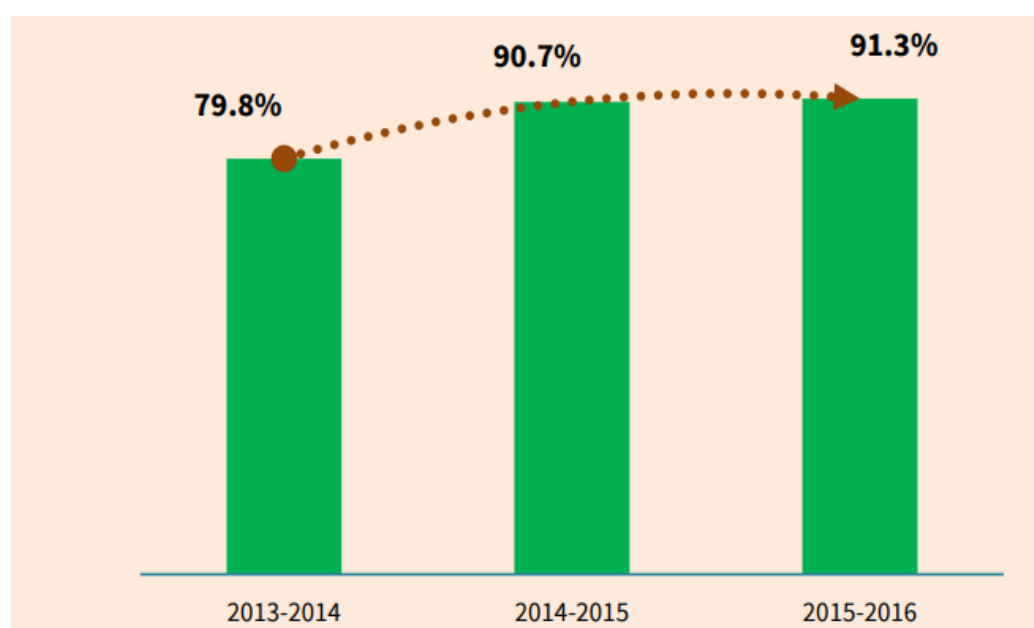
<https://www.minecofin.gov.rw/index.php?eID=dumpFile&f=113418&t=f&token=6013a96b0d019046634b47322c967347ecc6033c>

and as such, it may be undermining locally grounded experimentation, resource distribution and learning cycles seen in PDIA-like frameworks.

4.3.2 Hidden PDIA: Umuganda as De Facto Model of Iterative Problem Solving

Umuganda (“Coming Together”) epitomizes Rwanda’s bottom-up collective action, showing how local problem-solving models can scale. Rooted in pre-colonial practice, it was revived in 1998 to rebuild trust, repair institutions, and meet locally defined needs.⁸⁵ While a 2007 law mandates a monthly service day, participation is effectively voluntary and widespread as the graph below demonstrates.

BAR GRAPH 2 : EVOLUTION OF THE NATIONAL LEVEL OF CITIZENS’ PARTICIPATION IN UMUGANDA FROM 2013-2016



Source: MINALOC, Umuganda annual reports: 2014, 2015, 2016.

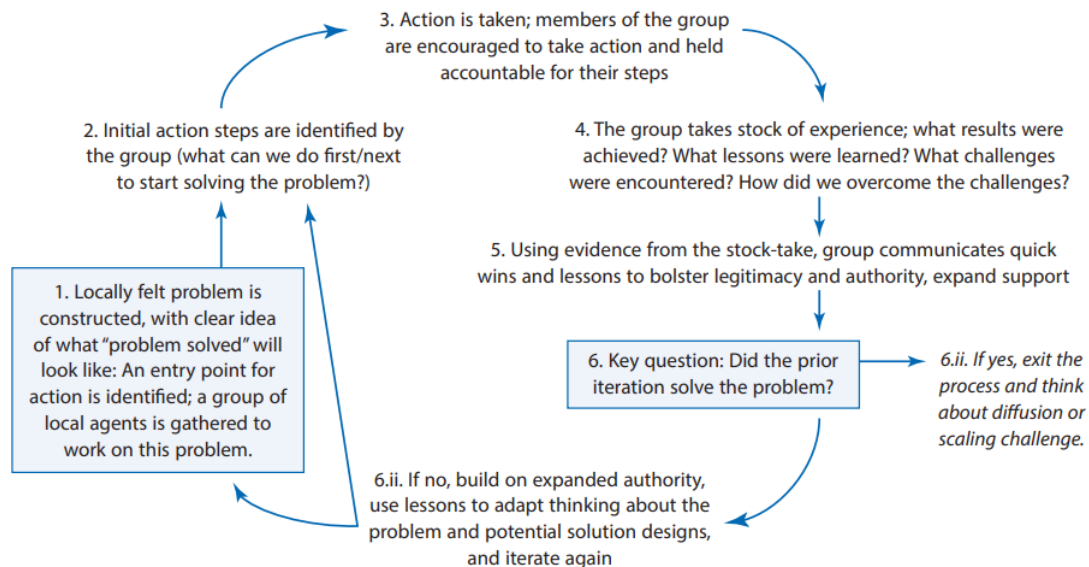
(Graph 1: Umuganda Participation Rates 2013-2016)

This practice has led to public consultation and volunteering on the construction of houses for the needy, schools, roads, health facilities and preparation of sites for settlement. It has made

⁸⁵ Rwanda Governance Board (RGB). *Impact Assessment of Umuganda: 2007–2016*. Kigali: RGB, 2016.
https://www.rgb.rw/fileadmin/user_upload/RGB/Publications/HOME_GROWN_SOLUTIONS/Impact_Assessment_of_Umuganda_2007-2016.pdf

possible access to clean water, hygiene and sanitation, environmental protection and neighbourhood beautification, with an estimated value of \$127 million between 2007 -2016. Despite not being intentionally framed as a PDIA initiative, Umuganda’s structure and evolution strongly mirror the four key stages of Problem-Driven Iterative Adaptation: *problem identification, experimentation and iteration, feedback and learning, and diffusion or scaling*.

Figure 1. **A six-stage “find and fit” iteration within the PDIA approach**



(Diagram 10: PDIA Six Stage Approach)

A critical component of Umuganda is the conclusion of the Day of Umuganda which ends with reflection meetings (embedded feedback loops) where residents assess what worked, what did not, and calibrated accordingly for future sessions. In doing so, Umuganda has become a channel through which most of the public policies, works and decisions are communicated, explained and negotiated with local residents.

A clear example is in Bugesera District. Residents leveraged Umuganda to combat deforestation and erosion through interactive trial and error reforestation drives, ultimately cultivating over 22,000 trees, including 7,000 indigenous ones, aligned with both ecological and livelihood goals.⁸⁶ In another case, *Umuganda* was used to iteratively build and repair Kanyinya’s rural

⁸⁶ KT Press. “Photos: Rwanda Kicks Off 63 Million Tree Planting Season During Umuganda.” *KT Press*, October 28, 2023. <https://www.ktpress.rw/2023/10/photos-rwanda-kicks-off-63-million-tree-planting-season-during-umuganda/>

roads linking communities to markets. Despite early resource and planning setbacks, successive sessions refined strategies, pooled resources, and finished viable roads⁸⁷ A number of innovative projects have also been the result of Umuganda activities including Mozilla's Common Voice project that collected voice data from Rwandans during monthly Umuganda and used the data to make voice assistance more inclusive in the local Kinyarwanda language.⁸⁸To facilitate local innovations like these, in 2010 the government initiated Umuganda competitions where the best activities at district and provincial levels are awarded a certificate and cash prize.

While *Umuganda* has been lauded for fostering community participation and contributing significantly to Rwanda's development, its implementation as a Problem-Driven Iterative Adaptation (PDIA) mechanism faces notable challenges. The Rwanda Governance Board's *Impact Assessment of Umuganda (2007–2016)* highlights several limitations.⁸⁹ Firstly, there is a tendency for local residents to plan ambitious projects that exceed their capacity, leading to incomplete or substandard outcomes. This indicates a gap between community aspirations and available resources or technical expertise. Secondly, the assessment points to issues of inadequate planning and organization at the local level, which can hinder the effectiveness of *Umuganda* activities. Moreover, the compulsory nature of participation, enforced by legal mandates, raises concerns about genuine community ownership and voluntary engagement. Such enforcement may lead to superficial involvement rather than fostering intrinsic motivation among participants. These challenges suggest that while *Umuganda* embodies elements of PDIA, such as local problem identification and iterative learning, its full potential is constrained by capacity limitations, planning deficiencies, and questions around participatory authenticity.

Adaptive-capacity analysis shows Rwanda steering uncertainty through learning, iterative planning, and coordinated reform. Vision 2020, EDPRS I/II, NST1, and Vision 2050 steadily recast innovation from connectivity to frontier tech, while scaling responsive governance across all levels. TNICI plans served as laboratories, shifting from infrastructure to e-government and inclusive tech ecosystems and paired with decentralization reforms the result has been a

⁸⁷ Ministry of Local Government (MINALOC). "Empowering Communities Through Umuganda." *ArcGIS StoryMaps*. Accessed May 20, 2025. <https://storymaps.arcgis.com/stories/cf9bef2f6f4441d099491ac87d01222a>

⁸⁸ Mozilla Foundation. "Open Voice Success in Rwanda." *Mozilla Foundation*, August 29, 2019. <https://foundation.mozilla.org/en/blog/open-voice-success-in-rwanda/>

⁸⁹ Rwanda Governance Board (RGB). *Impact Assessment of Umuganda: 2007–2016*. Kigali: RGB, 2016. https://www.rgb.rw/fileadmin/user_upload/RGB/Publications/HOME_GROWN_SOLUTIONS/Impact_Assessment_of_Umuganda_2007-2016.pdf

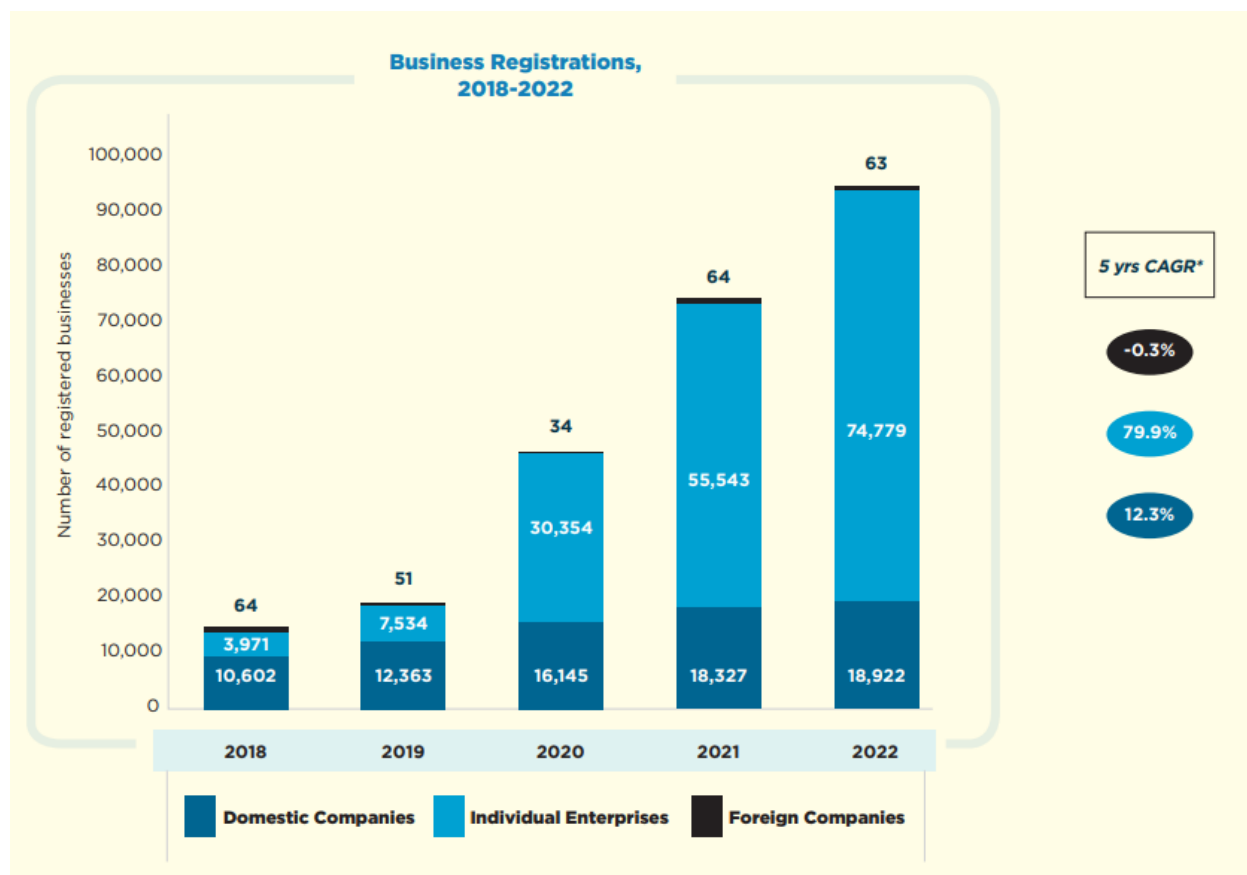
governance system that learns through implementation, improved service quality, citizen participation, infrastructure and support to innovative research and entrepreneurship. Rwanda's case demonstrates that adaptive capacity does not emerge from decentralization or technocratic governance alone, but from how institutions manage feedback, coordinate across scales, and empower grounded problem-solving. However, the country's governance is widely compliance-driven and coordinated rather than experimental at the subnational level. While Rwanda's centralized system has shown an aptitude for top-down coordination, the more elusive dimension of "room for autonomous change" is constrained by rigid performance regimes and limited local discretion. *Umuganda*, however, operates somewhat differently by prioritizing participation, improvisation, and cumulative learning. The strategy is a great example of how governance can be practiced as a distributed, adaptive process in ways that align with PDIA principles. Beyond the top-down adaptations lies a deeper question: how do actors within this system (local officials, entrepreneurs, civil servants) strategize when the future remains uncertain and resources are limited? This is where the effectuation logic becomes especially relevant.

4.4 Effectuation as Strategy under Constraint

Rwanda's strategic approach to supporting entrepreneurship and innovation within its NIS since 2000's has been a remarkable demonstration of effectual logic in practice: starting with available means (bird-in-hand), leveraging affordable loss, forming self-selected partnerships (crazy quilt), embracing contingencies (lemonade), and exercising agency over future outcomes (pilot-in-the-plane).

The government's investment in youth-driven entrepreneurship through programs like YouthConnekt has mobilized the country's large, underemployed youth population (35% of total population) to build startups and microenterprises using locally available resources and community knowledge. District-level peer learning, micro-grants and mentorship offered at local institutions like TVET centers and youth cooperatives have allowed youth to build resilience and agency by relying on what youth already have access to, rather than what they lack. Between 2019 and 2021, YouthConnekt had created over 13,000 jobs and supported 11,000

youth entrepreneurs across Rwanda's districts.⁹⁰ There has also been a notable increase in the number of business registration since the program became operational:



(Graph 2:RDB Business Registrations 2022)

SMEs now represent over 95% of all registered businesses, contribute roughly 41% of GDP, and employ more than 60% of the non-agricultural labor force.⁹¹

The country also turned the COVID-19 crisis into an opportunity to stimulate its domestic economy when it contracted- GDP -3.4 % (2022) versus +9.5 % (2019), its first recession since 1994. In response, it launched the Manufacture and Build to Recover Program (MBRP) to spur private investment in manufacturing and construction with fast-tracked investments via targeted tax exemptions: In 2022 it granted \$2.3 m in domestic and \$5.9 m in customs tax breaks to 27

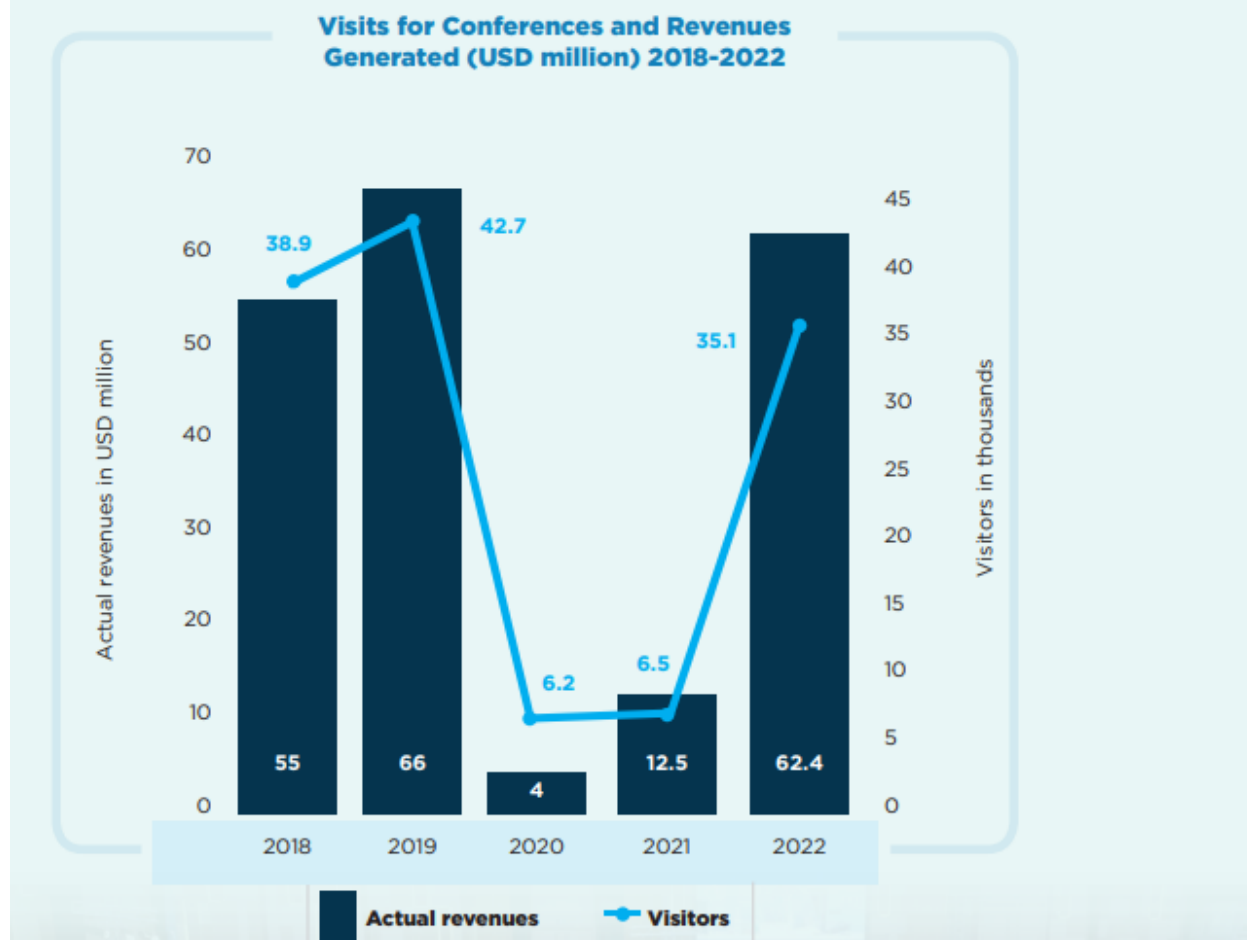
⁹⁰ UNDP Rwanda, *YouthConnekt Africa Hub Annual Report 2022* (Kigali: UNDP, 2023), <https://www.youthconnekt africa.org/sites/default/files/2021%20Annual%20Report.pdf>

⁹¹ National Institute of Statistics of Rwanda (NISR), *Rwanda Establishment Census 2017* (Kigali: NISR, 2018), <https://www.statistics.gov.rw/datasource/Establishment-Census/establishment-census-2017>

firms and attracted 100 + projects worth \$1.9 bn, projected to add 35,000 jobs. This is not the only instance of the “affordable loss” principle in action by the country. The Business Development Fund (BDF) de-risks start-ups with 50–70 % credit guarantees, privileging tolerable downside over maximum gain. By 2022, BDF had facilitated loans to over 30,000 SMEs, with a portfolio targeting women and youth-led enterprises.⁹² The government has been able to provide such comprehensive support mechanisms because of its wide network of partnerships with international development agencies, private investors and NGOs. In fact, the country has become a hub for conferences and meetings which in turn help to generate new investments into the country.

⁹²Rwanda Development Board, RDB Annual Report 2022 <https://rdb.rw/reports/RDB-Annual-Report-2022.pdf>

In 2022, Rwanda's MICE industry continued to grow with impressive results, generating a total of US\$ 62.4 million from hosting 104 events. These events were attended by more than 35,000 delegates, representing a significant increase from the previous year.



(Graph 3:RDB Conference Visit Revenue 2022)

State-of-the-art facilities like the Kigali Convention Centre, which has hosted numerous high-profile international events help to increase the country's visibility and appeal to foreign investors. Moreover, Rwanda's visa-free policy for all Africans will continue to significantly facilitate seamless business and tourism travel.⁹³ Because of this, Rwanda has proactively built partnerships with global business, academic and technology actors to co-create solutions tailored

⁹³ Igunza, Emmanuel. "Rwanda Announces Visa-Free Travel for All Africans as Continent Opens Up to Free Movement of People." *AP News*, November 2, 2023. <https://apnews.com/article/09edb93691babd5e0cebd2e131fd7ecb>

to local needs while also addressing regional and global concerns. This has also been beneficial for its university system: specialized research centers have been developed at the University of Rwanda supported by the World Bank as well as the Partners In Health in collaboration-University of Global Health Equity; international universities such as Kepler, African Leadership University and Carnegie Mellon have established campuses and strengthened partnerships to other international universities; and companies like Mastercard Foundation Regularly provided university scholarships and funding to scale up vocational training and entrepreneurship.

These targeted investments in higher education and research infrastructure have contributed directly to the growth of Rwanda's research ecosystem. The increasing presence of international academic institutions and the establishment of research centers in fields such as data science, public health, and renewable energy have led to a measurable rise in Rwanda's research output and innovation activity. Between 2010 and 2022, Rwanda saw a steady increase in scholarly publications and research collaborations, and the country has also reported an increase in intellectual property filings with a 50% in applications in recent years⁹⁴:

⁹⁴ Rwanda Development Board, RDB Annual Report 2022 <https://rdb.rw/reports/RDB-Annual-Report-2022.pdf>



(Graph 4: RDB Intellectual Property Applications 2022)

These measures collectively provide evidence of a deliberate effort of a country steering its own developmental course through forward-looking nation strategy. Additionally, this is all a part of the systemic evolution in public sector governance in Rwanda where the government regulates and catalyzes the innovation system. Built within frameworks like Vision 2020, Vision 20250, NICI I-III, EDPRS I and II and NST, are initiatives to foster a vibrant SME ecosystem and expand innovation infrastructure and human capital: the expansion of digital and technical education systems, targeted reforms to attract private investment and facilitate capital flows, international university partnerships, and the establishment of institutions that nurture

innovation, entrepreneurship, and inclusive enterprise growth. The outcome is national-scale effectuation; a living, experimental system, not a fixed blueprint.

5. The Vietnam Case

5.1 Introduction

Since Đổi Mới (1986), Vietnam has gradually moved from central planning to a socialist-oriented market economy. The Vietnam War (1955–1975) left the country deeply scarred: millions were killed or displaced, key infrastructure and agricultural systems were destroyed, and the economy was fractured along North-South lines. After reunification (1975), Hanoi imposed a Soviet-style model to nationalize industry and collectivize farms to spur reconstruction and equity. Pre-Đổi Mới, the economy was inward-looking and relied on Soviet aid, about US\$4million daily.⁹⁵ Hyperinflation hit 700 %, GDP per capita was US \$200, and 70 % of workers languished in low-yield agriculture. Moreover, strict industrial controls stifled production, innovation, and R&D, keeping Vietnam isolated from global markets.

With Soviet aid fading, unrest and bureaucratic stagnation drove policymakers to adopt Đổi Mới. Đổi Mới ushered in steady liberalization, land reform, trade openness, and institutional modernization. Consequently, Vietnam became one of Southeast Asia's most dynamic emerging economies through restructuring state institutions, attracting foreign direct investment, and embedding science, technology, and innovation (STI) within its development strategy while maintaining central state control. But Vietnam's progress has largely been driven by adaptive policy learning, decentralized reforms, and entrepreneurial improvisation by both public and private actors. From 2000 to 2024, Vietnam broadened and institutionalised its innovation agenda while averaging 7 % annual growth and reaching middle-income status. This period consolidated national innovation strategies, created specialised institutions, and expanded public-private partnerships to drive digital transformation and industrial modernisation. There are still, however, a number of institutional challenges around coordination, structural bottlenecks, inadequate innovation financing and skills mismatch with World Bank (2023) reporting that "Innovation has not played a significant role in the Viet Nam's economic growth to date. Average firm-level total factor productivity (TFP) grew by less than 2 percent between 2014 and

⁹⁵McWilliams, Edmund. "Vietnam in 1982: Onward into the Quagmire." *Asian Survey* 23, no. 1 (January 1983): 62–72.

2018, below the levels seen in many East Asian economies”.⁹⁶ The low contribution of innovation and technology absorption to economic growth represent lingering inefficiencies in state led planning in the country’s NIS.

5.2 Institutional Foundations in Mapping Vietnam’s National Innovation System

Though Đổi Mới sought economic revival, it quietly laid the institutional groundwork for a national innovation system. Economic stabilization and market liberalization took precedence in the 1990s through key institutional reforms and opening to international trade and investment, most notably through the 1995 accession to ASEAN and the 1987 Foreign Investment Law. This led to a surge in FDI that reached 10% of GDP by 1996.⁹⁷ Supporting institutional frameworks including the establishment of the Ministry of Science and Technology (MOST) in 1992, state programs on key scientific and technology and the National Program on High Technology Development in 1999 helped to organize and fund large scale, interdisciplinary research projects involving universities, research institutes, and enterprises. However, fragmented governance, low R&D, and weak firm-research ties curbed impact; still, SME promotion raised their share to 98% of firms by decade’s end.

Science and Technology Law of 2000

Now with public education expenditure having increased, the growth of SMEs and the initial legal foundations, innovation governance could be more properly formalized. The 2000 Science & Technology Law institutionalised coordination of research, tech transfer, and innovation support. The law explicitly defined the responsibilities of state institutions in the development of scientific research, technological advancement, and innovation capacity. It also assigned MOST lead STI agency and formalised funding, evaluation, IP protection, and private-sector R&D incentives. There were operational limitations that the law didn’t address, however, despite later complementary laws. Despite MOST, actual governance of science, technology, and innovation policy was distributed across multiple ministries without any clear coordination. The law also did not offer legal protections to firms undertaking risky innovation investments or any tools to insure

⁹⁶ World Bank. 2023. *Promoting Innovative Entrepreneurship in Viet Nam: An Ecosystem Diagnostic*. Washington, DC: World Bank. Available at: <https://documents1.worldbank.org/curated/en/099111623132511499/pdf/P178764034088f0840b95603af423252410.pdf>

⁹⁷ Anja Baum, *Vietnam’s Development Success Story and the Unfinished SDG Agenda*, IMF Working Paper WP/20/31 (2020)

compliance among enterprises and institutions and had limited provisions for state funding with low public spending on R&D (around 0.19% in 2002 and slow increases throughout the decade). What funding was available tended to be channeled disproportionately toward state-run research institutes with limited market engagement. The Vietnam Academy of Science and Technology (VAST) and Vietnam Academy of Social Sciences (VASS) drew most central grants but were criticised for academic, industry-misaligned research.⁹⁸

In review, the 2000 law appears to be more of a starting point than a blueprint for unlocking innovation through a national innovation system. The policy environment was heavily skewed toward centrally controlled public institutions, with few incentives for private firms to engage in long-term or high-risk R&D. But with the law, the state did show a willingness to engage non-state actors and support some operational decentralization in ways that did not exist prior. It also seems likely that the state realized gaps in institutional capacity or systemic coordination to translate vision into effective practice with mid 2000s legal instruments and laws.

Mid 2000s Laws on intellectual property, technology transfer, high technology, and technical standards

The mid-2000s statutes notably strengthened Vietnam's innovation architecture. These responded to the limitations of the 2000 STI law while also bringing Vietnam's innovation governance into closer alignment with developed economies. Specifically, the laws included: the Intellectual Property Law (2005), the Technology Transfer Law (2006), the Law on Standards and Technical Regulations (2006), and the High Technology Law (2008). Some of these laws were required as a part of international commitments such as the International Property Law, required in Vietnam's WTO ascension. Others signalled Vietnam's bid to integrate globally by tightening research–industry linkages. Overall, the the enactment of these laws resulted in a more predictable environment for innovation, increased foreign investment and heightened motivation for domestic R&D. This momentum was reinforced by the establishment of NAFOSTED and SATI in 2008, which aimed to institutionalize competitive research funding and stimulate

⁹⁸ Organisation for Economic Co-operation and Development (OECD) and World Bank. *Science, Technology and Innovation in Viet Nam: OECD Reviews of Innovation Policy*. Paris: OECD Publishing, 2014. <https://doi.org/10.1787/9789264213500-en>

enterprise-led innovation, though both agencies struggled to fully engage the private sector and drive commercialization.

But arguably one of the most foundational policies for Vietnam's National Innovation System was the High Tech Law. Not only did it codify “high technology” to meet international standards encompassing ICT, biotech, new materials and automation, it linked tax incentives with targeted support for innovation hubs, R&D by universities and firms and facilitated the transfer and absorption of advanced technologies. The law also created SHTP and Hoa Lac parks, drawing over \$1 bn and driving high-tech exports to 38 % of all exports by 2018.⁹⁹

Systemic Innovation Policy Reform (2010-2015)

Despite the mid 2000s series of technology related laws, Vietnam's policies seem to be more reactive and fragmented and unlike stronger foundations for a typical national innovation systems' legal framework. The resulting gains were clearly demonstrating a need for ecosystem development funding, policy and enforcement tools to build on the established laws. Vietnam had also made it clear that it wanted to become a middle income country with the introduction of the Socio-Economic Development Strategy (SEDS) 2011–2020 in 2010 where the country would begin to prioritize “*breakthroughs in institutional reform, human resource development, and infrastructure development,*” understanding that “science and technology must truly become a key driving force of the country.”¹⁰⁰

SEDS was Vietnam's way of acknowledging diminishing returns from capital-intensive growth and the need for productivity gains, innovation, efficiency and value-added production. It accepted that cheap labour and resources could no longer sustain rapid growth and recast innovation as integral to development. After its adoption, programs such as the “Programme for National Technology Innovation 2011 to 2020” were rolled out to fund SME innovation, collaborative R&D initiatives, and drive sectoral modernization, especially in agriculture and manufacturing. The program aimed to develop 4,000 national standards, with a target of aligning

⁹⁹ World Bank. *Vietnam Science, Technology and Innovation Report 2020*. Washington, DC: World Bank Group, 2020.
<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/345111606155888307/vietnam-science-technology-and-innovation-report-2020>

¹⁰⁰ United Nations Development Programme (UNDP). *SEDS Project Terminal Report*. Hanoi: UNDP Vietnam, 2011.
https://info.undp.org/docs/pdc/Documents/VNM/50577_SEDS_Project%20Terminal%20Report_2011.pdf

45% with international standards. By completion, 300 + SMEs adopted ISO quality systems.¹⁰¹ The National Product Development Programme 2011 meanwhile backed advantaged industries to create Vietnamese-branded, high-tech products. The government, through strategic programs with international agencies and funders, directly funded high quality, high yield rice; network information security products; and human and animal vaccines through grants, technical support, and incentives to research institutes, universities, and enterprises involved in the full innovation lifecycle—from ideation and prototyping to scaling and commercialization.

Then in 2012, Program 592 overhauled public research, boosting autonomy and commercialization. It let S&T institutes control budgets, staff, R&D priorities, and keep commercialization earnings. Because the autonomy was contingent on performance, reinforcing accountability mechanisms became integral. Accountability was also important because 592 sought to leverage private investment and international partnerships to support innovation, breaking from Vietnam's historical reliance on public-sector R&D funding. Market-based tools, such as technology valuation, licensing, and competitive project selection, as well as legal and financial guidance for transitioning research units into S&T enterprises, encouraged researchers to become entrepreneurs.

Despite this growing ambition, however, Vietnam's public investment in S&T remained modest: from 2011 to 2015, government spending on science and technology averaged just 1.7% of the national budget—roughly 0.4% of GDP—well below regional peers like Thailand (0.48%), Malaysia (1.26%), and Singapore (2.2%). Public institutions also dominated the national innovation landscape, with nearly 81% of total R&D spending in 2016 coming from the state sector. Program 844 in 2016 sought to rectify this with a National Startup Ecosystem Development Programme with activities that included incubators, mentorship and innovation training in universities while also focusing on *digital transformation and innovation diffusion, especially targeting traditional SMEs*.¹⁰²

Vision 2035 and Beyond

¹⁰¹ World Bank. *Vietnam: Science, Technology and Innovation Report*. Washington, DC: World Bank, 2021. <https://documents1.worldbank.org/curated/en/929681629871018154/Vietnam-Science-Technology-and-Innovation-Report.txt>

¹⁰² GIPA and Nesta. *Understanding Innovation Policymakers in Vietnam: GIPA Scoping Study*. London: Nesta, 2020. <https://media.nesta.org.uk/documents/Understanding-Innovation-Policymakers-in-Vietnam-GIPA-scoping-study.pdf>

In the same year, Vietnam introduced a long term vision for structural transformation in *Vision 2035*. Vietnam's vision for its future was rooted in meritocracy, rule of law, and knowledge-based competitiveness. In other words, a whole-of-government reform to improve domestic capabilities to absorb, adapt, and generate innovation. To move beyond reliance on cheap labor, Vietnam planned for deep investment in education, innovation infrastructure and governance and the document's co-authorship with the World Bank made it as much a critique of the country's growth limits as it is a roadmap for transformative change.

In the 2017–2021 period following Vision 2035's introduction, Vietnam introduced:

- The **Revised Law on Technology Transfer (2017)** to enable better commercialization of technology products;
- **Resolution No. 52-NQ/TW (2019)** and the **National Digital Transformation Program (2020-2030)** to guide Industry 4.0 adaptation;
- The **Science, Technology and Innovation Strategy 2021–2030**, which called for greater coordination, public–private partnerships, and investment in frontier technologies;
- The **National Innovation Center (NIC)** and the development of regional NICs. These hubs were designed to bridge the public–private divide and support startups, tech enterprises, and research commercialization.

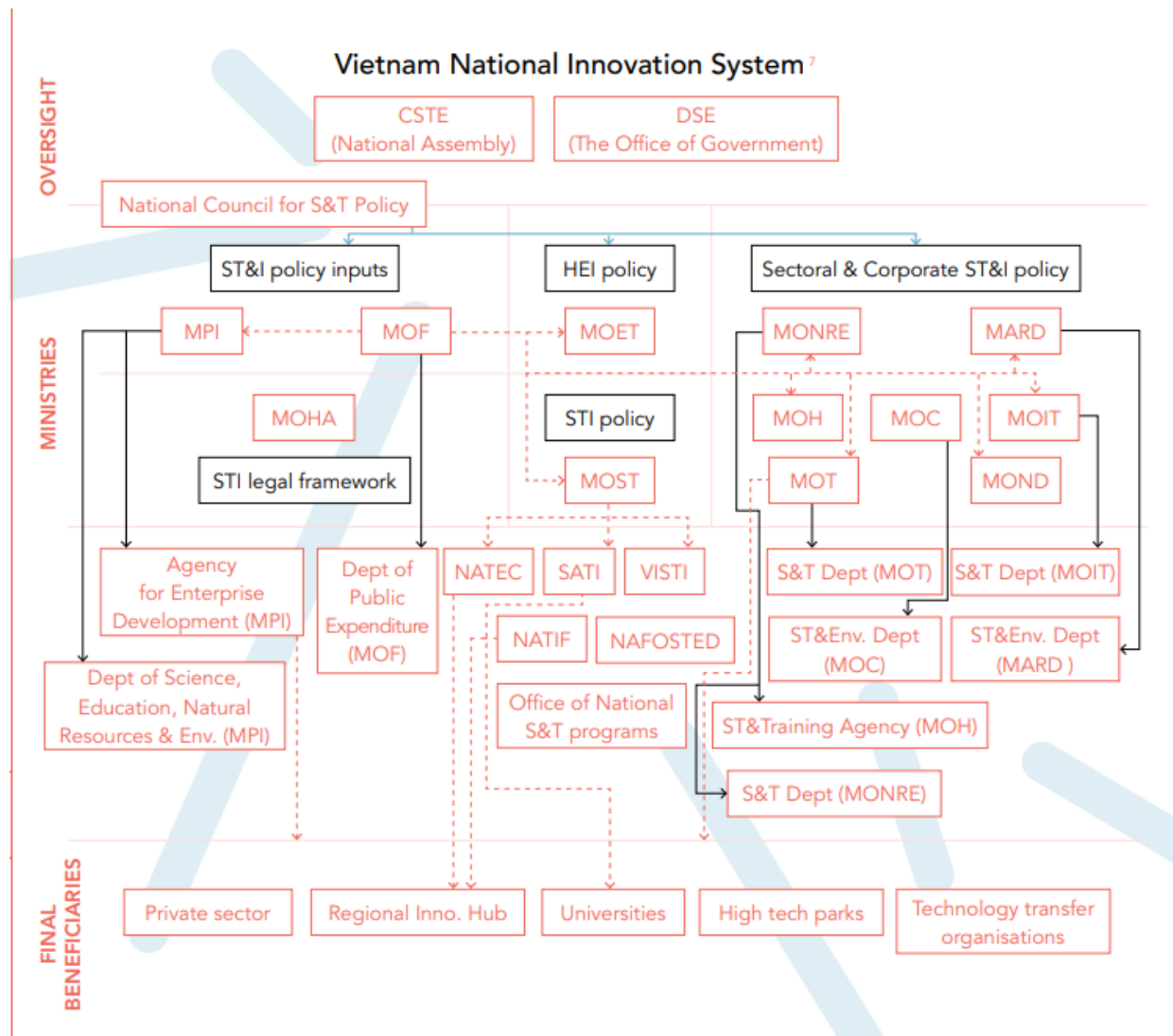
While limited institutional reform occurred following Vision 2025 as Detailed in later chapters, all of these policy developments point to its agenda-setting role. It showed that the country was determined to move from a state-led to factor-driven model and provided a way to envision Vietnam's National Innovation System.

Visualizing Vietnam's National Innovation System

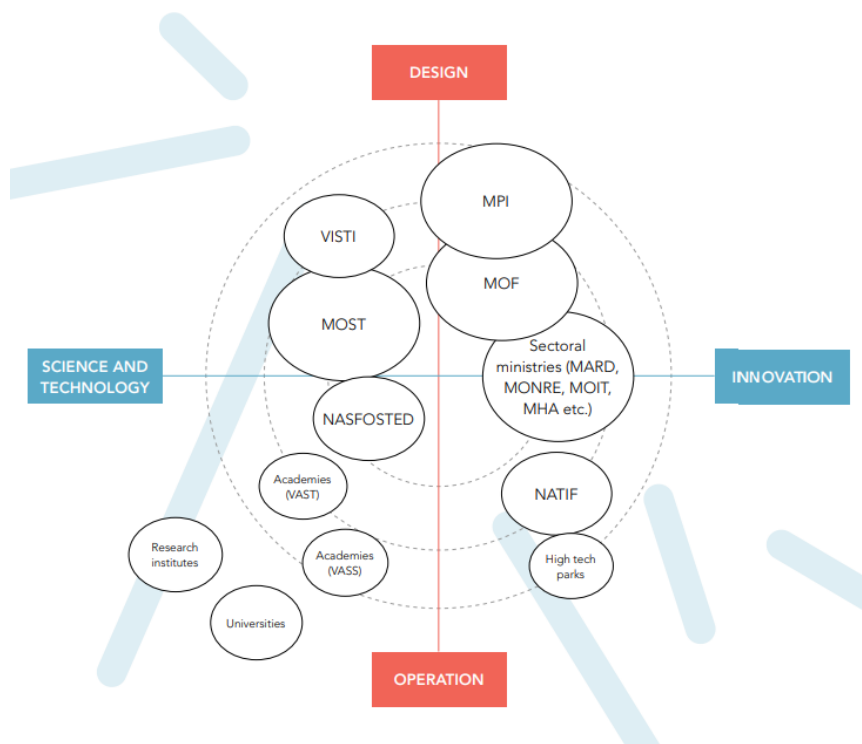
Vietnam's national innovation system is transitioning from basic design to systemic functionality. As illustrated in the visuals provided, Vietnam's NIS is overseen by high-level state bodies such

as the Science, Technology and Environment Committee (under the National Assembly) and the Department of Education, Science, Technology and Environment (under the Government Office), both of which advise on key national STI policies. At the operational level, the Ministry of Science and Technology (MOST) serves as the central coordinating body, developing and implementing national STI strategies, while other ministries—such as the Ministry of Planning and Investment (MPI) and the Ministry of Finance (MOF)—design innovation incentives and coordinate resource allocation. The first diagram also highlights how the system is anchored by three policy domains (STI inputs, HEI policy, and sectoral innovation strategies) which collectively structure how innovation support flows toward its final beneficiaries: private enterprises, academic institutions, innovation hubs, and technology transfer organizations. The second uses bubble size to serve as a proxy for institutional influence with larger bubbles to indicate greater authority or coordination power in shaping innovation policy and

implementation.



(Diagram 1:GIPA Vietnam NIS Scoping Study (2020))



(Diagram 2: GIPA IPA Vietnam NIS Concentrations Scoping Study (2020))

Despite these documents showing disproportionate policy and funding roles held by core ministries such as MOST, MPI, and MOF, Vietnam has nonetheless demonstrated a steady trajectory toward more adaptive and responsive innovation governance system since the early 2000s as the table summarizes below:

<i>Period</i>	<i>Key Policies/Programs</i>	<i>Core Institutional Changes</i>
1986–1999 (<i>Đổi Mới & Early Institutional Foundations</i>)	Đổi Mới reforms; Foreign Investment Law (1987); ASEAN accession (1995); MOST established (1992); National Program on High Technology (1999)	Opening to FDI; emergence of MOST; coordination of state S&T programs involving universities, research institutes, and enterprises
2000 (<i>Science and Technology Law</i>)	Science and Technology Law (2000); MOST designated as lead STI agency	Formalization of STI governance; assignment of roles to MOST; initiation of R&D support mechanisms and IP protection
2005–2008 (<i>Mid-2000s Legal Reforms</i>)	IP Law (2005); Technology Transfer Law (2006); Law on Standards & Technical Regulations (2006); High Technology Law (2008); NAFOSTED & SATI created (2008)	Expansion of legal infrastructure; alignment with international standards (e.g. WTO); support for high-tech zones; competitive research funding initiated
2010–2015 (<i>Systemic Innovation Policy Reform</i>)	SEDS (2011–2020); National Technology Innovation Program (2011–2020); National Product Development Program (2011); Program 592 (2012)	Shift to systemic governance; greater institutional autonomy (esp. in research); funding for SME innovation; sectoral R&D encouraged
2016–2020 (<i>Startup and Ecosystem Development</i>)	Program 844 (2016) – National Startup Ecosystem Development Program	Promotion of startup culture; development of innovation support structures (incubators, mentorship, regional training); digital transformation focus
Post-2016 (<i>Vision 2035 and Beyond</i>)	Vision 2035 (2016); Revised Technology Transfer Law (2017); Resolution 52-NQ/TW (2019); National Digital Transformation Program (2020); STI Strategy 2021–2030; NICs	Long-term system-level vision; emphasis on innovation as governance reform; public-private interface built through NICs; investment in frontier technologies

(Table 1: Author's own table on development of Adaptive Governance in Vietnam)

Vietnam's National Innovation System was initially constructed through legal codification and vertical coordination. But recent developments indicate a pivot toward more nuanced, networked, and adaptive governance.. The reforms reviewed here, from the High-Tech Law and Program 592 to the rollout of NICs, show that there is a growing presence of cross-sectoral strategies, digital transformation programs, and varied actors institutionalizing adaptive learning across levels of government in an expanding innovation ecosystem. What remains less clear is how Vietnam's governance system absorbs feedback, adjusts priorities, and responds to emergent challenges in real time.

5.3 Governance Dynamics and Adaptive Capacity

Over the past three decades, Vietnam has tripled its real per capita GDP, reduced poverty from over 60% to below 5%, and expanded health insurance coverage to over 86% of the population. The country has also transitioned away from an agriculture-dominated economy—agriculture’s share of GDP fell from over 40% in the 1980s to under 15% by 2020—toward a more diversified economic base powered by manufacturing, services, and export-oriented growth.¹⁰³ STI has emerged as both an enabler and a constraint of this growth: domestic patent applications rose by over 250% between 2000 and 2010; high-tech exports jumped from 20% in 2010 to nearly 38% of total exports by 2018, largely driven by foreign direct investment (FDI); and the country climbed steadily in the Global Innovation Index to reach 44th place by 2024.¹⁰⁴¹⁰⁵¹⁰⁶ On the other hand, domestic innovation performance is low and uneven. R&D intensity is still modest—gross domestic expenditure on R&D (GERD) was only 0.19% of GDP in 2002 and rose to just 0.53% by 2018—well below global averages.³ Enterprise innovation is weakly embedded in the domestic economy: fewer than 15% of Vietnamese SMEs report conducting any R&D activities, and a significant share continue to rely on imported technologies rather than generating their own.¹⁰⁷¹⁰⁸

Yet, Vietnam’s legal and institutional frameworks for STI have been ambitious, evolving through several phases: the Science and Technology Law of 2000, mid-2000s reforms around intellectual property and technology transfer, the National Program for Technology Innovation (2011–2020), and more recently, the Science, Technology and Innovation Strategy 2021–2030. Yet policy implementation has often lagged behind design. The GIPA (2020) scoping study reveals a “complex and fragmented institutional landscape,” in which ministries such as MOST, MPI, and MOF exercise overlapping mandates with limited horizontal coordination or policy

¹⁰³ World Bank. *Vietnam 2035: Toward Prosperity, Creativity, Equity, and Democracy*. Washington, DC: World Bank Group; Ministry of Planning and Investment of Vietnam, 2016. <https://openknowledge.worldbank.org/handle/10986/23724>.

¹⁰⁴ Nguyen, Anh, Mai Nguyen, and Hung Doan. *The Viet Nam National Innovation System: A Diagnostic Review*. MPRA Paper No. 58712. Munich: University Library of Munich, 2013. <https://mpra.ub.uni-muenchen.de/58712/>.

¹⁰⁵ World Bank. *Vietnam: Science, Technology and Innovation Report*. Washington, DC: World Bank, 2021.

<https://documents1.worldbank.org/curated/en/929681629871018154/Vietnam-Science-Technology-and-Innovation-Report.txt>.

¹⁰⁶ World Intellectual Property Organization (WIPO). *Global Innovation Index 2024: The Geography of Innovation*. Geneva: WIPO, 2024. <https://www.globalinnovationindex.org/>.

¹⁰⁷ World Bank. *Vietnam: Science, Technology and Innovation Report*. Washington, DC: World Bank, 2021.

<https://documents1.worldbank.org/curated/en/929681629871018154/Vietnam-Science-Technology-and-Innovation-Report.txt>.

¹⁰⁸ Nguyen, Anh, Mai Nguyen, and Hung Doan. *The Viet Nam National Innovation System: A Diagnostic Review*. MPRA Paper No. 58712. Munich: University Library of Munich, 2013. <https://mpra.ub.uni-muenchen.de/58712/>.

coherence.¹⁰⁹This fragmentation is felt at the subnational level: a 2015 joint review by MPI and MOST found that provincial Departments of Science and Technology (DOSTs) “function primarily as administrative executors” of centrally-designed programs, lacking the autonomy, training, or resources to drive localized innovation.¹¹⁰A separate survey by MOST, OECD, and UNESCO found that over 40% of DOST personnel had no formal training in STI policy or technology management.¹¹¹The result is an innovation governance system that has produced pockets of progress, particularly in infrastructure, education, and FDI-led technology diffusion, but continues to struggle with systemic coordination, institutional learning, and endogenous innovation capacity. This tension is precisely what Vision 2035 seeks to address. But a deeper analysis of Vietnam’s governance structure necessitates a framework that moves beyond policy intentions to assess adaptability, coordination, and feedback mechanisms.

5.3.1 Evaluating Vietnam’s Adaptive Capacity through the ACW

As Vietnam oriented itself toward market liberalization, it was compelled to rethink its innovation agenda to align with the dynamics of a competitive, knowledge-based economy.

¹⁰⁹ GIPA and Nesta. *Understanding Innovation Policymakers in Vietnam: GIPA Scoping Study*. London: Nesta, 2020.

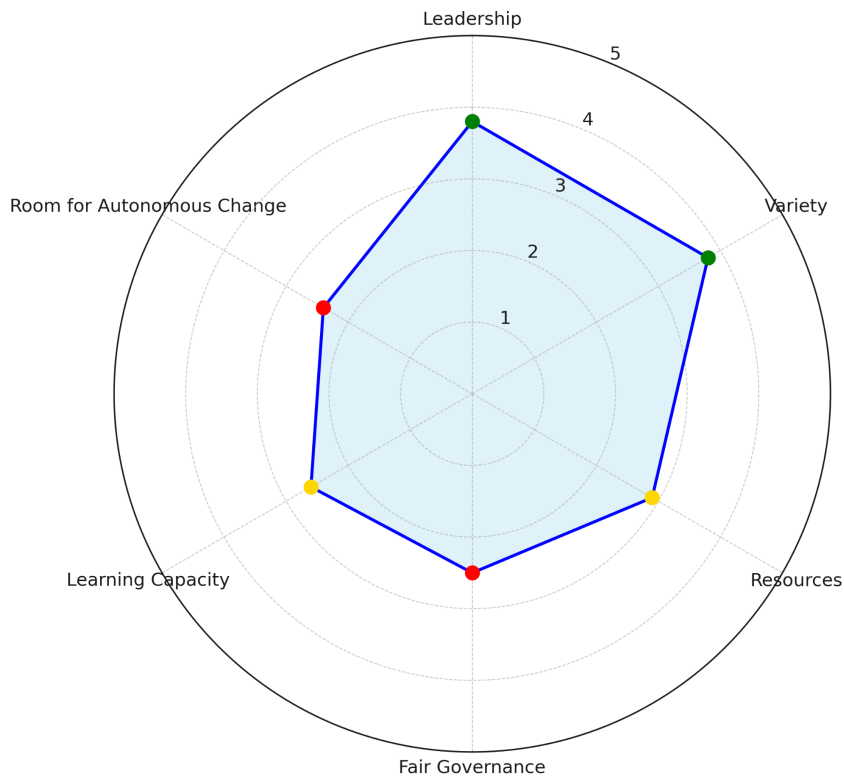
<https://media.nesta.org.uk/documents/Understanding-Innovation-Policymakers-in-Vietnam-GIPA-scoping-study.pdf>.

¹¹⁰ Ministry of Planning and Investment (MPI) and Ministry of Science and Technology (MOST). *Joint Review of Vietnam’s Science, Technology and Innovation System*. Hanoi: Government of Vietnam, 2015.

¹¹¹ Ministry of Science and Technology (MOST), Organisation for Economic Co-operation and Development (OECD), and United Nations Educational, Scientific and Cultural Organization (UNESCO). *Vietnam Science, Technology and Innovation Policy Review: Executive Summary*. Paris and Hanoi: OECD/UNESCO/MOST, 2012.

<https://www.worldbank.org/content/dam/Worldbank/document/EAP/Vietnam/Vietnam-STI-review-executive-summary.pdf>

Adaptive Capacity Profile: Vietnam



(Chart 1: Author's own radar chart)

The dimension of **variety (3.8)** has manifested through a proliferation of strategies, actors, and sectoral priorities to reflect the state's increasing recognition that innovation could not be engineered through a single, centralized blueprint. The GIPA Scoping Study (2020) identifies over 30 distinct policy-making and implementing bodies involved in science, technology, and innovation (STI), spanning central ministries, line agencies, regional departments, and affiliated research units. This breadth of actors range from the (MOST), the Ministry of Planning and Investment (MPI), and the Ministry of Finance (MOF), to more specialized bodies like NAFOSTED and SATI. the heart of this system is a layered policymaking audience, categorized by the study into a “core” audience of 5–6 primary STI policy institutions and a “wider” ecosystem of over 50 secondary and tertiary bodies whose activities intersect with innovation—from education and health to environment and trade. This distribution of responsibility and influence exemplifies Vietnam's attempt to build redundancy and sectoral diversification into its innovation system, allowing for parallel experimentation, differentiated

problem-framing, and more context-sensitive policy design.

Yet as the study discusses, overlapping mandates and weak coordination dilute the adaptive benefits of institutional variety. FMOST, MPI, MOET, and MIC each run uncoordinated incubators, accelerators, and tech-transfer schemes lacking shared metrics. This overlap breeds duplication, funding inefficiencies, and private-sector confusion. At the subnational level, Departments of Science and Technology (DOSTs) are tasked with implementing centrally designed innovation programs, but they have little discretion or input in the design stage. For funding, the Ministry of Finance plays a critical role in financing STI initiatives, particularly those involving tax incentives or budget allocations. Absent a joint MOF–MOST evaluation framework, disbursements lag and strategic program. Like the National Innovation Fund and tech-startup support are underfunded.

This absence of strong integration and coordination mechanisms also affects **learning capacity (2.6)**. GIPA regards institutional learning in Vietnam’s innovation system as “limited and patchy,” with weak feedback loops and sporadic evaluation mechanisms. Although ministries like MOST and MPI generate technical reports, these are rarely integrated into upstream policymaking or used to revisit core assumptions. Correspondingly, just 3% of policymakers say evaluations strongly guide new policy; over 60% deem them weak or absent. This indicates a learning structure that is neither embedded nor systematically incentivized and lacking formal STI policy training, staff struggle to adjust implementation from field feedback. The World Bank's Vietnam STI Review (2021) noted that while agencies like NAFOSTED and SATI improved technical review procedures, “evaluation results are rarely used to revise strategic direction or funding priorities”¹¹² On the positive side, performance-based evaluations have begun to emerge in some initiatives. For instance, the revised Law on Technology Transfer (2017) includes provisions for monitoring commercialization metrics. However, the ecosystem’s ability to co-produce and adapt knowledge across sectors is also evident through academic and scientific institutions that play a peripheral role in shaping iterative learning within Vietnam’s national innovation system. Less than 15% of Vietnamese SMEs report engaging with universities for R&D, and even fewer have sustained partnerships for co-innovation. Evidently,

¹¹² **World Bank.** *Vietnam: Science, Technology and Innovation Report*. Washington, DC: World Bank, 2021.
<https://documents1.worldbank.org/curated/en/929681629871018154/pdf/Vietnam-Science-Technology-and-Innovation-Report.pdf>

academic and research institutions have not yet become core nodes in the feedback and adaptive learning structures of Vietnam's STI framework. In turn, this raises questions about whether Vietnam's STI ecosystem creates sufficient space for self-directed change, localized initiative, and decentralized problem-solving.

Vietnam has increasingly experimented with administrative, fiscal, and institutional reforms aimed at enhancing local autonomy within the national innovation system (NIS). The 1996, 2002, and 2015 State Budget Laws, for example, successively expanded provincial fiscal powers, letting sub-national governments set budgets and priorities. By 2016, local governments controlled over half of public spending approx. 17 % of GDP, which is high for Vietnam's development stage.¹¹³ But fiscal decentralization seldom delivers real autonomy. Reports show S&T gets just 0.3–0.5 % of provincial budgets, largely absorbed by administrative costs, not innovation. And while local actors are formally included in consultation processes, they are rarely positioned as equal partners in policy co-creation or implementation. The lack of symmetrical participation has stifled the emergence of "bottom-up" innovation ecosystems, especially in less-developed provinces and limits **room for autonomous change (2.4)**. There are, however, pockets of experimentation and gradual shifts toward autonomy for example, through Program 592. Still, the autonomy granted has proven partial at best: public R&D institutes stay under central oversight; ministerial and party agendas still set priorities and metrics, not bottom-up or industry needs.

In fact, Vietnam's innovation landscape has been significantly shaped by strong, centralized **leadership (3.8)**, particularly through the Communist Party of Vietnam (CPV). The CPV provides consistent strategic direction, but also imposes a hierarchical command structure that limits distributed decision-making power. The BTI 2024 Country Report places Vietnam 100th out of 137 countries in political transformation, characterizing it as a "hard-line autocracy," with a leadership model rooted in top-down control and weak participatory mechanisms.¹¹⁴ Vietnam's governance index score is 5.16 out of 10 (ranked 48/137) with moderate performance on rule of

¹¹³ **World Bank**. *Making The Whole Greater Than The Sum Of The Parts: A Review of Fiscal Decentralization in Vietnam*. Washington, DC: World Bank, 2015.
<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/276211468186541422/vietnam-fiscal-decentralization-in-support-of-economic-growth-and-poverty-reduction>.

¹¹⁴ **Bertelsmann Stiftung**. *BTI 2024 Country Report — Vietnam*. Gütersloh: Bertelsmann Stiftung, 2024.
<https://bti-project.org/en/reports/country-report/VNM>.

law, steering capability, and consensus-building. While stability has allowed Vietnam to maintain policy coherence and attract sustained FDI inflows, it has also stifled dissenting views and limited opportunities for adaptive leadership at the grassroots and institutional margins. Vietnam's top leadership has, however, maintained an innovation-oriented discourse. Vietnam earns a high leadership score due to its consistent top-level commitment to positioning STI at the core of its long-term development agenda. Over the past two decades, the central government has articulated a clear strategic direction through a series of coordinated reforms: from (SEDS) 2011–2020 to Vision 2035 and the STI Strategy 2021–2030. These documents not only supported change t from low-cost labor to knowledge-based growth but were also accompanied by concrete programs, such as the National Technology Innovation Programme and Program 592, which enabled commercialization of public research. The establishment of the NIC and ongoing investment in high-tech sectors are a part of the state's agenda-setting role and its capacity to marshal public and private actors around shared national priorities. Despite ongoing implementation challenges, the sustained vision, institutional reform efforts, and measurable outcomes—such as Vietnam's rise in the Global Innovation Index to 44th place by 2024 and a tripling of per capita GDP—demonstrate a high degree of strategic coherence, policy ambition, and political will at the national level.

However, such ambitions are not always matched by practice with the World Bank noting that “Government initiatives in support of innovation remain heavily supply-driven, often lacking input from industry or universities,” revealing a lack of inclusive or networked leadership mechanisms. The BTI report further highlights that although the CPV leadership maintains firm macroeconomic control, it “lacks reform-minded visionaries who could lead a more open, responsive, and experimental governance culture”. Leadership appointments are based on political loyalty rather than technical expertise, limiting innovation in public sector institutions and policy experimentation. As has been noted throughout this analysis, Vietnam's leadership narrative is one of directional strength but limited institutional learning with a “steering without scaffolding” structure where central direction exists without sufficient institutional support across the NIS.

Acknowledging the risks of overly centralized steering, Vietnam has introduced a new wave of

coordination platforms and flagship institutions. The National Innovation Center (NIC) launched in 2019 serves as a public–private hybrid incubator, bringing together startups, multinationals, universities, and government labs within a single policy sandbox to pilot breakthrough technologies. In late 2024, a Central Steering Committee was empowered to convene top officials from MOST, MPI, MOF, and sectoral agencies, tasked explicitly with synchronizing Vietnam’s digital transformation roadmaps and tracking key indicators such as ICT penetration and high-tech export growth. The committee aims to position Vietnam among the top 30 nations globally in innovation and digital transformation by 2045, with ambitious goals such as achieving a digital economy contributing at least 30% of GDP by 2030 and 50% by 2045.¹¹⁵ These developments come in recognition that traditional ministerial silos have hindered cross-sectoral innovation, yet are dependent on MOST and MPI for budgetary allocations and mandate definitions. The future performance of these initiatives will rely not only on policy design but also on how well Vietnam addresses two structural challenges—strategic **resources (2.9)** and the **fairness of governance (2.5)** frameworks that determine voice, access, and authority.

Much has already been said about Vietnam’s resource allocations, from modest R&D investment to strategic infrastructure such as the NIC, as well as assessments of fair governance through global indices and econometric indicators that highlight both progress and persistent centralization. But these two dimensions remain deeply interlinked in Vietnam: the extent to which resources are mobilized and distributed can either strengthen or undermine public trust, institutional equity, and systemic responsiveness. The gross expenditure on R&D (GERD) has been rising steadily between 2002 and 2018, however, Vietnam still struggles to keep up with regional and global counterparts in this area as the table below demonstrates .¹¹⁶

¹¹⁵ Ministry of Science and Technology. “Viet Nam Establishes Central Steering Committee to Lead Innovation and Digital Transformation.” *MOST.gov.vn*, December 26, 2024.

<https://www.most.gov.vn/en/news/959/viet-nam-establishes-central-steering-committee-to-lead-innovation-and-digital-transformation.aspx>

¹¹⁶ World Bank. *Vietnam: Science, Technology and Innovation Report*. Washington, DC: World Bank, 2021.

<https://documents1.worldbank.org/curated/en/929681629871018154/pdf/Vietnam-Science-Technology-and-Innovation-Report.pdf>

Table 2: R&D expenditure by some countries (% of GDP)

Year	2012	2014	2016	2018
Vietnam	0.19	0.37	0.44	0.53
Japan	3.48	3.54	3.5	3.43
China	1.78	1.99	2.06	2.12
America	2.67	2.71	2.72	2.82

Source: World Bank

(Table 1: R&D Expenditure 2012-18 Selected Countries)

This funding gap has led to the private sector playing a crucial role in innovation funding. In 2023, Vietnam attracted \$2.3 billion across 141 deals in sectors including artificial intelligence, energy, healthcare, and education, signaling sustained investor confidence despite a global capital slowdown.¹¹⁷ At the end of 2024, the total registered FDI reached approximately \$38.23 billion, with realized capital estimated at \$25.35 billion, marking a 9.4% increase compared to the previous year.¹¹⁸ Private investments along with public initiatives like the Low-Income Innovation Project and the National Innovation Center (NIC), have funded about \$190 million for technology innovation companies in Vietnam, in particular SMEs- 53% of which have applied at least one type of innovation (including improving products/services, developing new products/services, improving production processes, and applying new technology and knowledge management).¹¹⁹ However, only about 22.7% of Vietnamese SMEs carry out R&D, compared to 43.1% of large companies.¹²⁰ There is also strong differences in the proportion of SMEs

¹¹⁷ Boston Consulting Group (BCG). *Southeast Asia's Moment: Investing for Impact and Innovation*. January 2025.

<https://www.bcg.com/publications/2025/southeast-asia-vietnam-innovation-and-private-capital-report>.

¹¹⁸ General Statistics Office of Vietnam. *Foreign Investment Statistics 2024*. Hanoi: GSO, 2025.

<https://www.gso.gov.vn/en/data-and-statistics/2025/01/foreign-investment-2024>.

¹¹⁹ Tran, Trang & Vu, Ngoc. (2024). Innovation in Small and Medium Enterprises in Vietnam. *Asian Journal of Science, Technology, Engineering, and Art.* 2. 304-319. 10.58578/ajstee.v2i2.2805.

¹²⁰ *ibid*

participating in entrepreneurship and innovation between regions¹²¹:



Figure 1: The rate of SMEs participating in innovation in the regions

(Chart 2: Rate of SMEs in Vietnam Regions World Bank 2023)

The disparities in SME innovation engagement reflect the governance challenges previously discussed. Fair governance is not solely a matter of legal equality or anti-corruption efforts; it is also measured by the consistency and equity of institutional support across geographic and socio-economic divides. While some provinces benefit from access to NIC-backed programs and public-private partnerships, others remain institutionally marginalized, lacking the capacity to absorb innovation funding or participate in national initiatives. This unevenness reflects broader governance dynamics. Vietnam ranked 81st out of 142 in the World Justice Project's Rule of Law Index (2024), and while its government effectiveness score sits at the 56th percentile globally (World Bank 2023), the country continues to score low on transparency, with a 2024

¹²¹ World Bank. 2023. *Promoting Innovative Entrepreneurship in Viet Nam: An Ecosystem Diagnostic*. Washington, DC: World Bank. Available at: <https://documents1.worldbank.org/curated/en/099111623132511499/pdf/P178764034088f0840b95603af423252410.pdf>

Corruption Perceptions Index score of 40/100.¹²²¹²³¹²⁴ So while Governance effectiveness, investments in innovation related projects and support for companies may be improving, fair governance remains aspirational, particularly for marginalized provinces and under-resourced districts.

On paper, the country has embraced innovation as a national priority, embedding it into strategic visions, legal reforms, and institutional frameworks. But beneath these plans lies a governance system still grappling with fragmentation, asymmetry, and dense centralization. Despite visible efforts to promote innovation through new programs and partnerships, many ministries still operate in isolation, hindered by blurred mandates and limited capacity to absorb lessons from what works and what does not. Feedback mechanisms, where they exist, are rarely integrated into upstream policy design. Local actors, though sometimes formally included in consultation processes, seldom have the authority, resources, or political capital to shape decisions in meaningful ways. Evidence points to Vietnam's governance model offering clarity of purpose but struggling to evolve organically, often favoring managed performance over adaptive learning.

5.3.2 PDIA in Vietnam

Three major projects demonstrate how PDIA principles have taken root in local governance contexts in Vietnam, even if not always explicitly labeled as such: the Decentralized Programme for Rural Poverty Reduction (DPPR), the Commodity-oriented Poverty Reduction Programme (CPRP), and the Sustainable Rural Development for the Poor (SRDP). In the DPPR, implemented in Ha Giang and Quang Binh Provinces between 2004 and 2011, the establishment of 716 Village Management Groups (VMGs) that were empowered to plan, implement, and monitor localized infrastructure projects such as rural roads and irrigation systems. Crucially, the program emphasized adaptive learning where community members and local officials collaborated to solve emergent problems through on-the-ground experimentation. IFAD evaluations show that by the end of the program, over 3,600 small infrastructure works had been

¹²² World Justice Project. *Rule of Law Index 2024*. Washington, DC: World Justice Project, 2024.

<https://worldjusticeproject.org/rule-of-law-index>.

¹²³ World Bank. *Worldwide Governance Indicators 2023*. Washington, DC: World Bank Group, 2023. <https://info.worldbank.org/governance/wgi/>.

¹²⁴ Transparency International. *Corruption Perceptions Index 2024*. Berlin: Transparency International, 2024. <https://www.transparency.org/en/cpi/2024/index/vnm>.

completed with a strong sense of ownership from local communities, reducing delays and increasing maintenance sustainability.¹²⁵

Similarly, the CPRP in Ha Giang adopted a problem-driven approach by focusing on transforming subsistence farming into commercial production, in response to market access issues and chronic rural poverty. It built value chains for key crops and let commune units iteratively adjust to local conditions. The participatory diagnostic process used to design interventions was key to uncovering localized constraints.¹²⁶ Similarly, the SRDP (2013–2018) in Ha Tinh and Quang Binh project institutionalized the use of the Model of Socio-Economic Development Planning (MoSEDP) at the commune level, a planning tool that promoted bottom-up decision-making through inclusive stakeholder consultations.¹²⁷ Each commune developed MoSEDPs based on identified constraints and evolving needs, and updated them annually. Additionally, the establishment of Women’s Development Funds under SRDP not only addressed gender-based financial exclusion but also enabled real-time policy adaptation based on field-level experience. Through these funds, over 20,000 women gained finance and training, raising household income and resilience.

DPPR, CPRP, and SRDP apply PDIA-style iterative problem-solving, local decision-making, and participatory diagnostics. These projects advanced institutional experimentation and endogenous problem-solving through mechanisms such as Village Management Groups, commune-level planning units, and gender-inclusive finance platforms that underscore the importance of governance adaptability for sustaining inclusive growth and responding to complex, localized development challenges. Finally, they demonstrate that bottom-up adaptation can emerge in resource-constrained Vietnam, often easing regional resource gaps without top-down reform.

¹²⁵International Fund for Agricultural Development (IFAD). 2014. *Project Completion Report Validation: Decentralized Programme for Rural Poverty Reduction in Ha Giang and Quang Binh Provinces (DPPR)*, Socialist Republic of Vietnam. Rome: IFAD. Accessed May 29, 2025. https://www.ifad.org/documents/38714182/39729786/vietnam_dppr.pdf

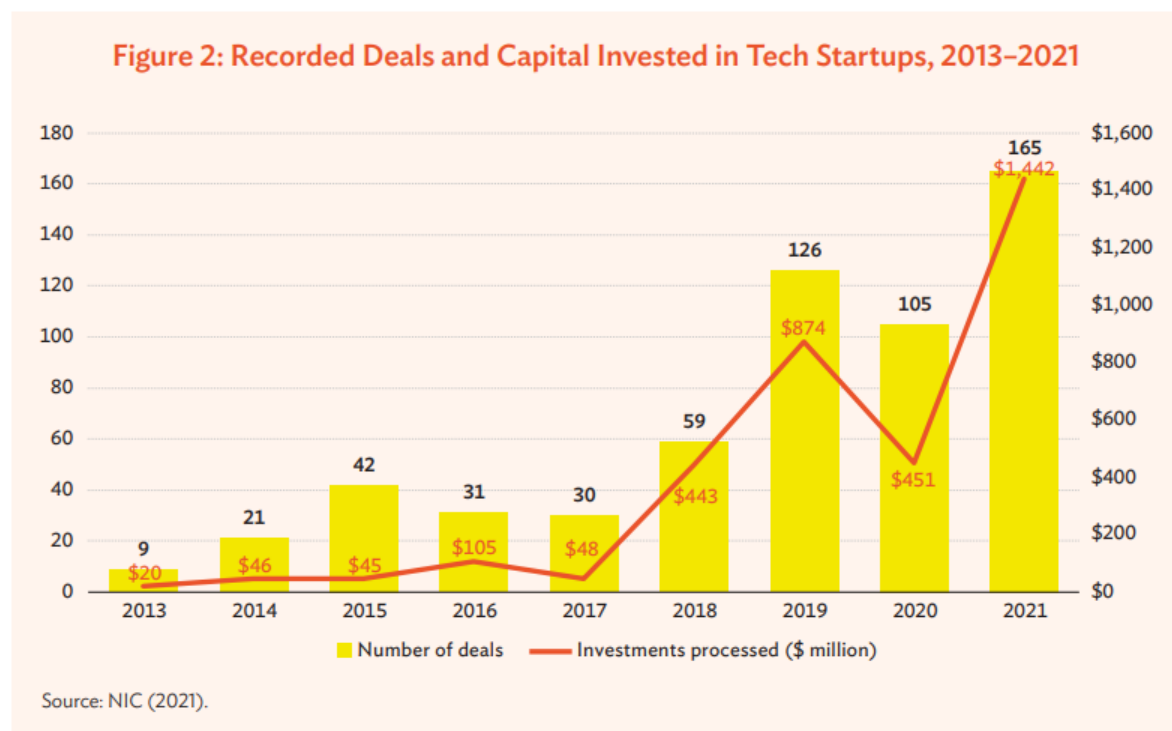
¹²⁶ International Fund for Agricultural Development (IFAD). (2019). *Viet Nam: Commodity-oriented Poverty Reduction Programme in Ha Giang Province – Supervision Report, November 2019*. Rome: IFAD. Retrieved from <https://www.ifad.org/documents/48415603/49455874/Viet+Nam+1100001663+CPRP+Supervision+Report+November+2019.pdf>

¹²⁷ibid

5.4 Effectuation as Strategy under Constraint

While effectuation is rarely recognized formally within Vietnam's policy discourse, it is increasingly evident across different levels of the innovation ecosystem. This evidence includes grassroots experimentation, adaptive public programs and evolving entrepreneurial practice. In Vietnam, limited R&D intensity, weak institutional learning, and centralized steering create a governance environment that often discourages high-risk, long-term innovation planning. Yet it is precisely under these constraints that effectuation becomes useful. It enables actors to pursue innovation not by waiting for ideal conditions, but by leveraging what is immediately accessible, engaging stakeholders early, and adapting plans as new opportunities and setbacks emerge.

In 2016, the Prime Minister approved Project 844, the most direct government intervention to create a favorable environment for Vietnamese startups. Since then, there has been a sharp increase in capital invested in the country¹²⁸:

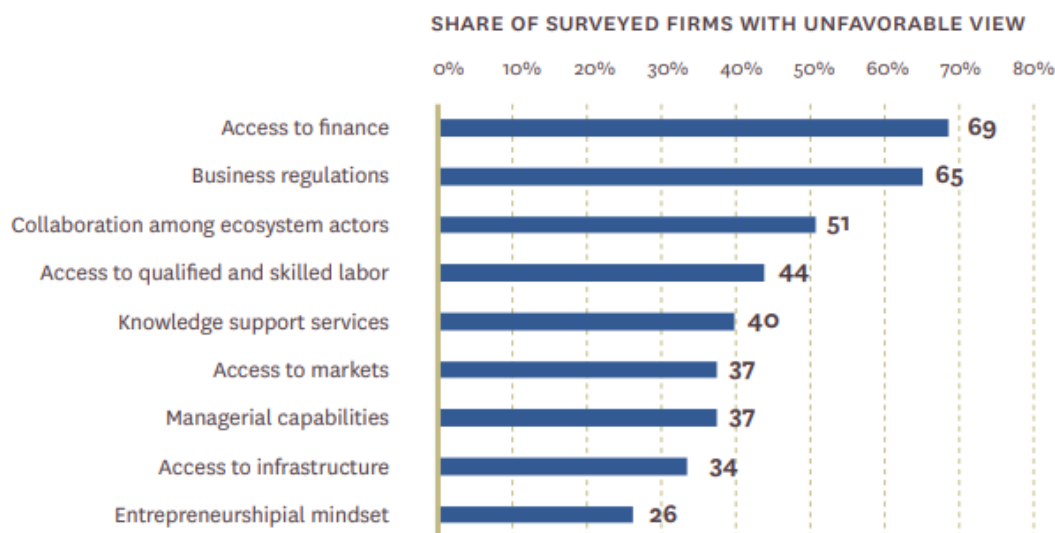


(Graph 1: Recorded Deals and Capital Invested in Tech Startups 2013–2021)

¹²⁸ Asian Development Bank. *Viet Nam's Ecosystem for Technology Startups*. Manila: Asian Development Bank, 2023.

Despite these improvements, 69% firms described their access to finance as “very unfavorable” or “slightly unfavorable,” and 65% of firms reported the same for their interactions with business regulations, access to skilled labor (44%), support services (40%), managerial capabilities (37 percent), and access to markets (37 percent):

FIGURE 19: KEY CHALLENGES FACING SURVEYED STARTUPS



SOURCE: World Bank Innovative Startups Survey.

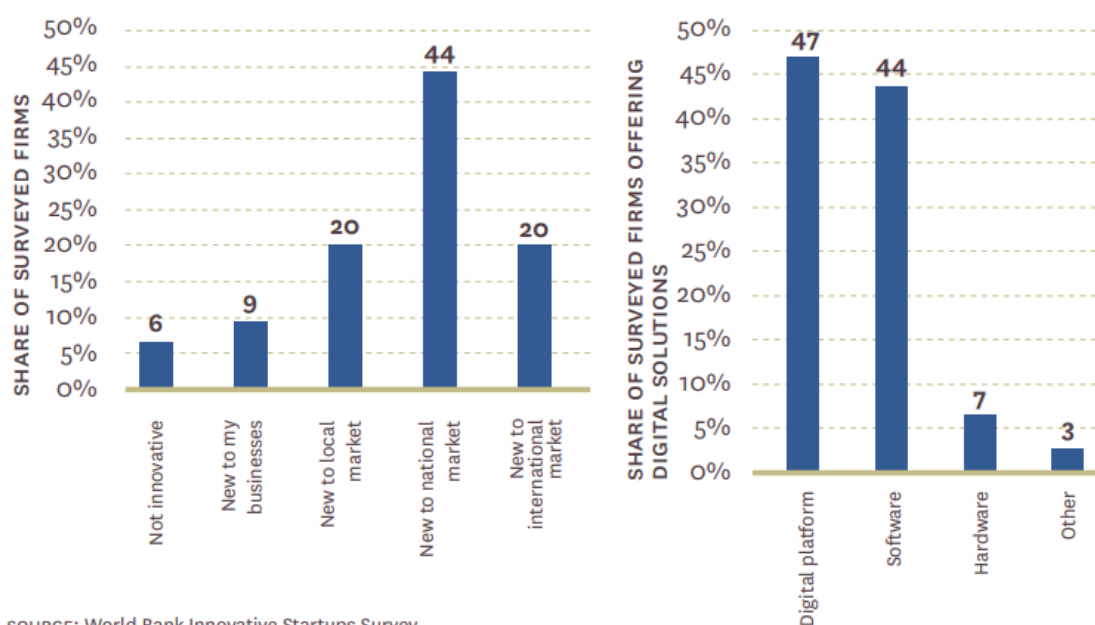
(Graph 2: Key Challenges Facing Surveyed Startups in Vietnam)

Platforms like the National Innovation Center (NIC) and a growing constellation of incubators and accelerators in Hanoi and Ho Chi Minh City have provided partial scaffolding. However, much of the ecosystem still operates on bootstrapping: 82% reported using personal savings and 50% report receiving support from family and friends. As previously mentioned, 53% of which have applied at least one type of innovation yet only 26% of these develop full business plans before launch; mostly pivoting based on customer feedback, form ad hoc partnerships, and gradually scale operations once product-market fit is confirmed. This is especially visible in Vietnam’s fintech and edtech sectors, where companies adapt rapidly to user preferences and regulatory shifts.

These patterns demonstrate effectual action: using what is at hand, engaging with stakeholders to co-create opportunities, and treating uncertainty as a resource rather than a risk in an environment where only 10-15% of startups survive beyond three years. A study of startups in Vietnam introduced an Effectuation Index to quantify the degree of effectual logic and found that Vietnamese startups exhibited high EI scores (between 0.31-0.95) indicating a strong reliance on effectual reasoning.¹²⁹ Such companies adapt requirements based on immediate customer feedback instead of predefined specifications.

As a result, 40% of firms offer products and services that are new to the Vietnamese market and 20% new-to world.¹³⁰

FIGURE 16: A. INNOVATIVENESS OF PRODUCTS/SERVICES; B. TYPE OF SOLUTIONS OFFERED TO CUSTOMERS



(Graph 3: Innovativeness of Products/Services in Vietnamese startups by type of solutions)

¹²⁹ Nguyen-Duc, A., Kemell, K.-K., & Abrahamsson, P. (2021). The entrepreneurial logic of startup software development: A study of 40 software startups. *Empirical Software Engineering*, 26(5), 91. <https://doi.org/10.1007/s10664-021-09987-z>

¹³⁰ *Promoting Innovative Entrepreneurship in Viet Nam: An Ecosystem Diagnostic*. Washington, DC: World Bank. <https://documents1.worldbank.org/curated/en/099111623132511499/pdf/P1787640340880840b95603af423252410.pdf>

Despite promising signs, Vietnam's institutional environment remains only partially conducive to effectuation. Local entrepreneurs and researcher-entrepreneurs often operate in a system that discourages experimentation, penalizes failure, and limits discretionary decision-making. Vietnam's rigid regulatory structures and accountability frameworks create strong incentives for risk aversion. For example, public researchers working within state-owned R&D institutes face fixed evaluation criteria focused on output quantity (e.g., published articles or registered patents), with limited recognition for commercial experimentation or iterative project design. Similarly, entrepreneurs at the local level, especially outside Hanoi and Ho Chi Minh City, struggle to access innovation funding unless they conform to predefined project formats or align closely with national strategic sectors. Those who attempt to pivot, iterate, or pursue unconventional solutions often find themselves excluded from formal support systems or unable to meet grant compliance standards. As a result, effectual practices persist, but mostly at the margins, through informal networks, bootstrapped ventures, or donor-funded programs that provide temporary policy space.

Scaling the use of Effectuation across the entrepreneurship landscape in Vietnam would require recognizing effectual actors (startups, community innovators, local planners) as legitimate co-creators, institutional reforms that promote experimentation, decentralize authority, and reward adaptive capacity. This might include outcome-based funding models, innovation vouchers for local SMEs, and flexible procurement mechanisms for R&D. Similar mechanisms have proven effective elsewhere: Nigeria's use of adaptive, iterative funding during pandemic recovery enabled real-time policy adjustments for local firms, while innovation voucher schemes in countries like the Netherlands and South Korea have helped SMEs access R&D services without needing to navigate rigid procurement processes.¹³¹¹³²¹³³

¹³¹ World Bank. *Nigeria COVID-19 Action Recovery and Economic Stimulus Program (P174114)*. Washington, DC: World Bank, 2020.

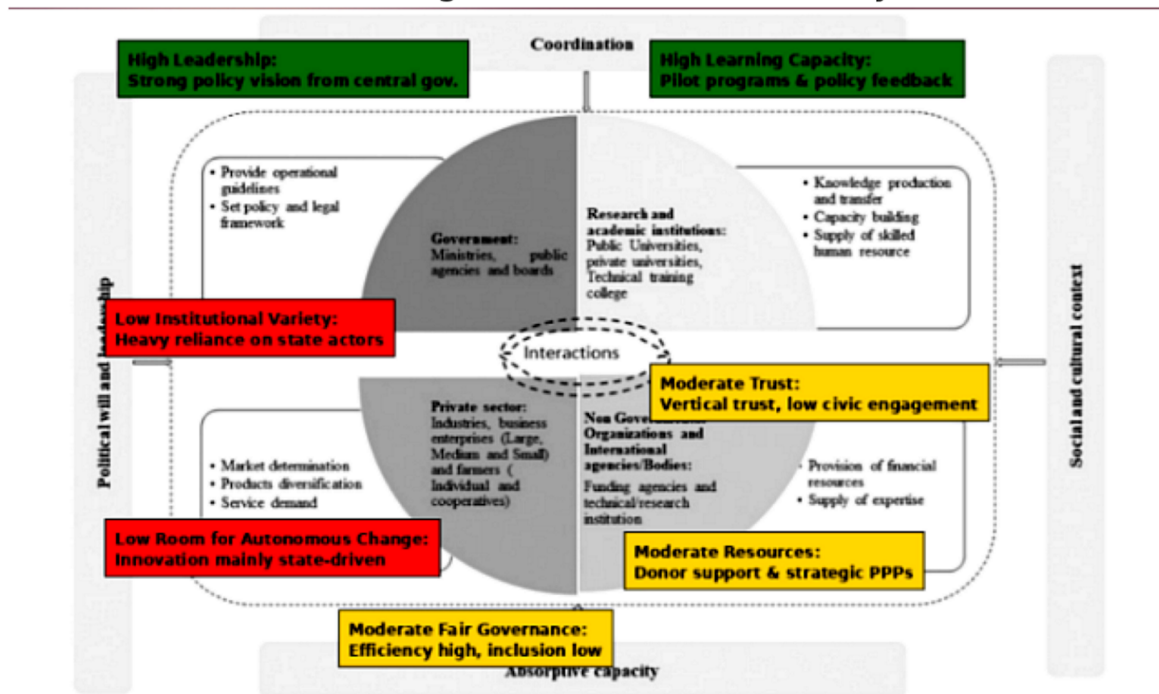
¹³² OECD. *Incentives for SMEs to Invest in Skills*. Paris: OECD Publishing, 2021

¹³³ OECD. *OECD Economic Surveys: Korea 2020*. Paris: OECD Publishing, 2020

6. Comparative Analysis: Innovation Governance in Rwanda and Vietnam

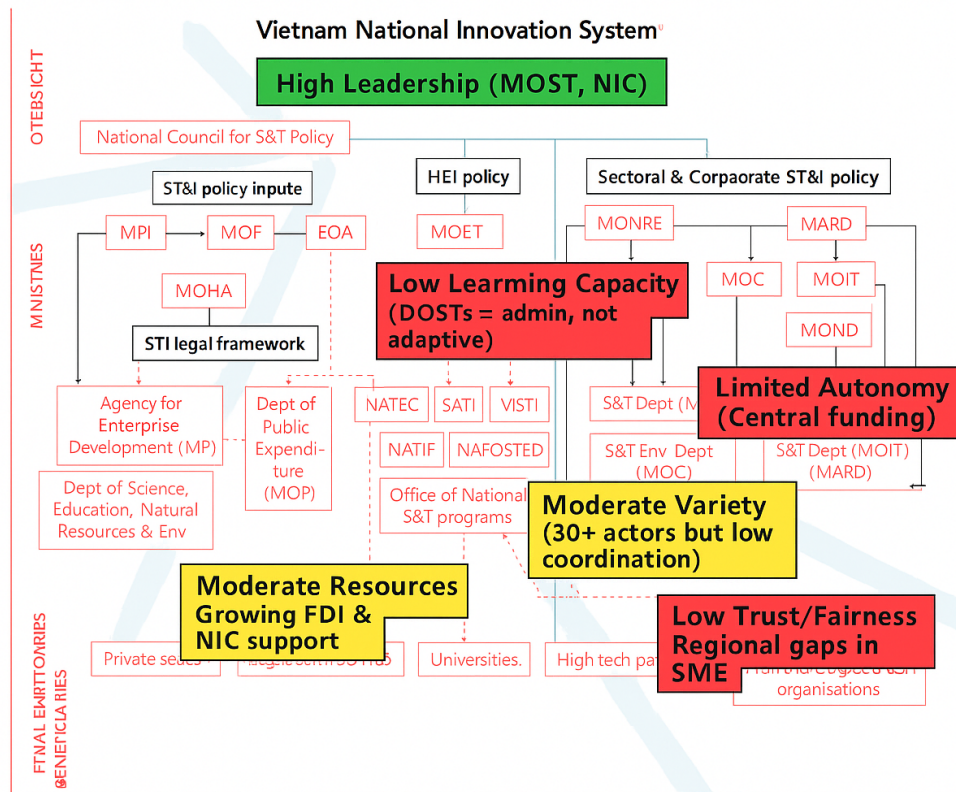
6.1 Innovation System Structures: Comparative Strengths and Gaps

Differing state traditions, coordination mechanisms, and developmental path dependencies have produced unique models of innovation governance in Rwanda and Vietnam. Moreover, Vietnam's population of nearly 100 million provides a significantly larger base for innovation activity and enterprise formation than Rwanda's 13 million. But institutional design has played much more of a role than demographic scale. Rwanda's innovation system is defined by its centralized, vertically integrated structure, with most innovation mandates housed within MINICT, RDB, and affiliated national programs such as the Ministry of Education's support for research and skills development. This streamlined hierarchy has enabled strong top-down coordination, strategic coherence, and rapid execution of national priorities such as Smart Rwanda and Vision 2050. However, strength in vertical discipline also exposes systemic weaknesses: decision-making authority is concentrated at the center, while subnational and non-state actors play marginal roles in policy co-creation, resource allocation, or innovation experimentation.



(Diagram 1: Author's own diagram annotating Rwanda's NIS)

In contrast, Vietnam has established a dense but uneven network of actors across ministries, regional Departments of Science and Technology (DOSTs), public research institutions, and emerging intermediaries. While this configuration promises polycentric engagement often associated with resilience, it lacks the mechanisms to aggregate learning, prioritize initiatives, or hold stakeholders accountable for performance. DOSTs are administrative arms of central ministries with minimal room for policy adaptation, and no strong evaluative loops means local experimentation rarely feeds back into national agendas. The systemic gap for Vietnam, unlike Rwanda, lies not in actor diversity but in connective tissue since there is an absence of effective steering, integration, and evaluation functions.



(Diagram 2: Author's own diagram annotating Vietnam's NIS)

In Rwanda, the interlinkages across government, research, and private sector actors are typically mediated through centralized project coordination mechanisms. Initiatives such as Kigali Innovation City demonstrate public-private cooperation, but these are exceptions in a system where most actors operate under state-defined mandates. Civil society and academic institutions have limited autonomy or budgetary discretion, and there is no formalized mechanism to include SMEs or regional innovation hubs in policy formulation. The result is a system with strong administrative coherence but limited absorptive diversity; adaptive capacity is high at the center but thin at the margins. Provincial and district-level governments have little discretion over innovation funds or programmatic autonomy although they are included in Hanga innovation competitions. This is perhaps by design as innovation infrastructure such as the most important hubs, training centers, and applied research labs still remain concentrated in Kigali.

While Vietnam has a broader spread of innovation infrastructure, its absorptive capacity is almost equally unbalanced, with rural and less industrialized provinces struggling to translate

policy access into performance. MOST plays a central but not exclusive role, complemented by MPI, MOF, and other specialized institutions like NAFOSTED and SATI. This breadth enables Vietnam to accommodate multiple innovation objectives simultaneously from sector-specific transformation (e.g., agriculture, ICT, biotech) to national digital ambitions through the Science, Technology and Innovation Strategy 2021–2030 and the NIC. At the same time, the country struggles with implementation coherence, learning integration, and regional parity as multiple agencies have similar innovation-related mandates.

Both countries operate within constrained fiscal envelopes, but the structure and leverage of their resources differ, decisively shaping both innovation outputs and broader development. Rwanda's vertically integrated system resulted in focused gains aligned with national priorities, such as near-universal 4G coverage (98.76%) and strategic R&D investments that reached 0.79% of GDP by 2023, outpacing Vietnam (0.4%% of GDP) in relative research intensity despite a smaller economy (\$409 billion to \$14.1 billion)¹³⁴¹³⁵¹³⁶ However, significant breakthroughs in innovation output have yet to materialize: Rwanda recorded 12 local intellectual property and 363 international applications in 2023.¹³⁷ Vietnam's more dispersed and polycentric system has enabled greater scale and diversity in innovation output, with 9,460 patent applications filed in 2023 (991 by residents) and 3,668 patents granted¹³⁸ Vietnam also leads in high-tech exports, accounting for 42.69% of all manufactured exports in 2022—equivalent to approximately \$135.9 billion USD—whereas Rwanda's high-tech exports amounted to just \$6.8 million.¹³⁹

Still, Rwanda's centralized system has enabled better coordination between innovation funding and national development goals through performance-based budgeting- 85% of districts now include ICT development indicators in Development Strategies and 60% of higher-ed students are enrolled in STEM related courses according to NST 1 planning documents.¹⁴⁰ Strategic alignment in Rwanda has also contributed to its stronger economic performance, reflected in an

¹³⁴ ITU DataHub, "Mobile Network Coverage – Rwanda," ITU 2025, <https://datahub.itu.int/data/?e=ZMB&i=100095&s=19306&v=chart>

¹³⁵ NCST Rwanda, *R&D Expenditure Report* (2023), <https://www.ncst.gov.rw>

¹³⁶ UNESCO Institute for Statistics (UIS), *Research and Development Expenditure (% of GDP)*. World Bank Data. Accessed April 5, 2025. <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

¹³⁷ Rwanda Development Board, *RDB Annual Report 2023* <https://rdb.rw/ar/2023-RDB-AR.pdf>

¹³⁸ Elite Law Firm. "Vietnam Patent Statistics in 2023." *Law Firm Elite*, February 24, 2024. <https://lawfirmelite.com/vietnam-patent-statistics-in-2023/>.

¹³⁹ World Bank. *High-technology exports (current US\$) – Vietnam*. Accessed May 6, 2025. <https://data.worldbank.org/indicator/TX.VAL.TECH.CD?locations=VN>.

¹⁴⁰ Republic of Rwanda. *National Strategy for Transformation 2017–2024: Priority Area 1—Economic Transformation*. Ministry of Finance and Economic Planning <https://faolex.fao.org/docs/pdf/rwa206814.pdf>

8.2% GDP growth rate in 2023 compared to Vietnam's 5.3%.¹⁴¹¹⁴² Although Vietnam hosts a much larger absolute number of SMEs (approximately 700,000), Rwanda actually records a higher SME density per capita—with roughly 8.1 SMEs per 1,000 people compared to Vietnam's 7.¹⁴³¹⁴⁴ But while Rwanda's model delivers alignment and discipline, Vietnam's breadth allows for diffusion and scale, even as both grapple with regional equity, absorptive capacity, and systemic learning. The infusion of external capital has been a lifeline for innovation, especially for SMEs in fields like AI, healthcare, and green tech which has led to a diversified innovation landscape.

These systemic characteristics are mirrored in their Global Innovation Index (GII) performance, which evaluates innovation inputs (such as institutions, human capital, and infrastructure) and outputs (like knowledge and technology). Vietnam's higher rank (44th, score: 36.2) is indicative of its broader capacity to convert inputs into more diverse outputs, whereas Rwanda's narrower system places it at 104th (score: 19.7).¹⁴⁵

The contrasting architectures of Rwanda's centralized system and Vietnam's polycentric network are reflections of the governance patterns that have shaped them since 2000. Vietnam's diverse innovation landscape promotes scalability and sectoral diversity but faces challenges in cohesive policy implementation. Rwanda's command over policy optimizes strategic delivery but underperforms in co-creation and scaling national strategies. Both have experienced impressive innovation outputs gains that are however, often dissipated amid fragmented oversight, weak integrative mechanisms and/or stifled experimentation and subnational initiative.

6.2 Comparative Governance Dynamics and Adaptive Capacity

The combined ACW-informed radar chart comparison below speaks to the governance structures underlying each country's adaptive performance:

¹⁴¹ Ministry of Finance and Economic Planning (MINECOFIN). "Economy Registered 8.2% Growth in 2023." *Republic of Rwanda*, January 2024. <https://www.minecofin.gov.rw/news-detail/economy-registered-82-growth-in-2023>

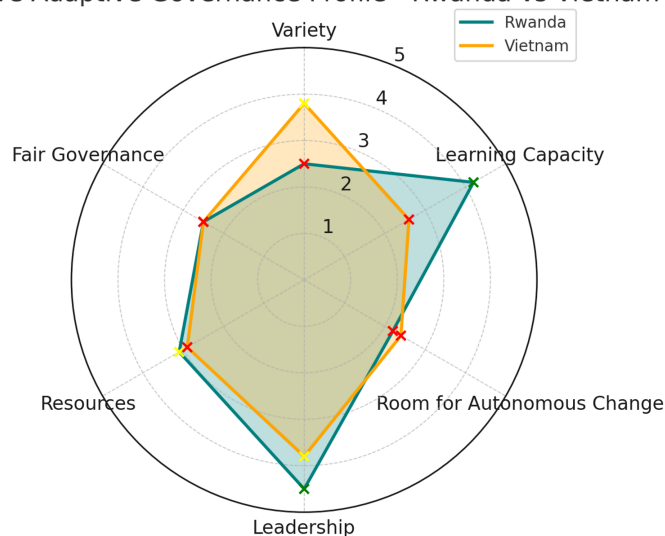
¹⁴² General Statistics Office of Vietnam. "Socio-Economic Situation in the Third Quarter and Nine Months of 2023." *General Statistics Office of Vietnam*, October 2023. <https://www.nso.gov.vn/en/data-and-statistics/2023/10/socio-economic-situation-in-the-third-quarter-and-nine-months-of-2023/>

¹⁴³ Rwanda Development Board. *Business Register 2024: Key Statistics on Registered Enterprises*. Kigali: RDB, 2024

¹⁴⁴ OECD (2021), *SME and Entrepreneurship Policy in Viet Nam*, OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris, <https://doi.org/10.1787/30c79519-en>.

¹⁴⁵ World Intellectual Property Organization (WIPO). *Global Innovation Index 2024*: <https://www.wipo.int/gii-ranking/en>

Comparative Adaptive Governance Profile - Rwanda vs Vietnam (ACW)



(Chart 1: Author's own comparative radar chart)

Comparative ACW Scores for Rwanda and Vietnam

Dimension	Rwanda Score	Vietnam Score
Variety	2.5	3.8
Learning Capacity	4.2	2.6
Room for Autonomous Change	2.2	2.4
Leadership	4.5	3.8
Resources	3.1	2.9
Fair Governance	2.5	2.5

(Table 1: Author's own Comparative ACW Scores Table)

Leadership represents the strongest adaptive capacity for both Rwanda and Vietnam, yet the nature of that capacity diverges sharply. Rwanda scores higher (4.5) due to a centralized model of directive coordination led by MINICT, the Rwanda Development Board (RDB), and the Prime Minister's Office. These bodies have consistently articulated and enforced long-term agendas like Vision 2020 and NICI I-III, all of which represent a strong capacity to steer innovation through high-level visioning. Furthermore, Rwanda displays pronounced entrepreneurial and

collaborative leadership within the central administration, evident in cross-agency alignment around flagship initiatives like e-governance expansion. However, this strength is tempered by a limited distribution of leadership authority. Collaborative mechanisms outside the executive center are underdeveloped, with local governments and civil society organizations not playing design and planning roles but mostly implementational. Authority is centralized, and while this ensures policy cohesion, it risks curtailing bottom-up leadership emergence, experimentation, and feedback loops from peripheral actors. Vietnam scores slightly lower (3.8) but still relatively high because of diffused leadership across multiple ministries (MOST, MPI, MOF) and regional DOSTs, contributing to its higher **variety** score (3.8 vs Rwanda's 2.5).

While this set-up allows for broader participation and institutional specialization, it suffers from limited policy steering capacity and weak integration of strategic goals across vertical and horizontal layers. Although central strategies such as the Science, Technology and Innovation Strategy 2021–2030 offer aspirational direction, they are often undercut by institutional overlap and inconsistent follow-through, which erode the leadership's capacity to guide systemic adaptation. On the other hand, through performance contracts (Imihigo), sector scorecards, and executive steering mechanisms, Rwanda has institutionalized leadership as a continuous function, not political directive. But despite their vastly different institutional architectures, Rwanda and Vietnam each score 2.5 on **fair governance** because both countries exhibit formal commitments to transparency, accountability, and inclusion, but fall short in operationalizing these principles consistently across actors and geographies. Vietnam ranked 83rd only modestly better than Rwanda's 53rd place for governance performance in terms of corruption control and rule of law, although public opinion might laud Rwanda's rooting out of corruption.¹⁴⁶ This could be because of the stifling of dissent or negative perception towards the government resulting in high recorded public satisfaction with service delivery and e-government uptake. Meanwhile behind the scenes, national consultations are structured and monitored, but they are one-directional, with limited scope for community-led policy influence. Vietnam has notably greater bureaucratic opacity and weak procedural accountability. Overlapping mandates privilege incumbent actors and crowd out grassroots experimentation. What's more, the Vietnam Provincial Competitiveness Index (PCI) 2022 highlights that only 39% of surveyed firms believe

¹⁴⁶ Transparency International. *Corruption Perceptions Index 2024*. Berlin: Transparency International, 2024.
<https://www.transparency.org/en/cpi/2024/index/vnm>.

that their business associations are effective in representing their interests, and many provincial departments have inconsistent mechanisms for including SMEs or research institutions in innovation-related decision-making.¹⁴⁷ Still, the presence of formal learning systems in Rwanda and Vietnam coexists with persistent deficits in fair governance.

In both contexts, fairness in governance serves as a structural gate to learning. The result has been higher **learning capacity** in Rwanda (4.2) because of vertical feedback integration across strategic programs. Annual leadership retreats are a cornerstone of Rwanda’s learning model which has operated iterative scaling on a “plan, monitor, correct” basis within the state in response to performance data. Previous targets are regularly audited, policy failures are confronted, and new priorities are framed based on real-world implementation experience. This strategy has directly influenced revisions to major policy frameworks, including EDPRS cycles and NS T1. Through its mechanisms to develop learning capacity, there is double-loop learning where the government goes beyond adjusting implementation tools but questioning and revising the underlying policy assumptions themselves. Vietnam’s learning capacity (2.6) is single-loop in nature, focused on procedural compliance rather than reflection on policy assumptions or ecosystem alignment. The country has struggled to build durable institutional memory- many STI programs lack clear archival protocols or are disrupted by leadership turnover and shifting donor priorities. For example, although the revised Law on Technology Transfer (2017) and the STI Strategy 2021–2030 emphasize learning and feedback, implementation remains compliance-oriented not adaptive. Unlike Rwanda, while formal evaluations are conducted, particularly through MOST, the World Bank, and international donor partnerships, there is limited evidence of systematic integration of findings into upstream policy processes. Yet despite Rwanda’s strong feedback architecture at the national level, the learning ecosystem remains incomplete. Subnational governments, academic institutions, and civil society have few pathways to contribute knowledge that shapes national policy. This could mean there have been missed contexts and bottom-up innovation insights that inform policy and improve outcomes.

The asymmetry in feedback utilization highlights a deeper structural issue common to both systems: the constrained **room for autonomous change**. In Rwanda, the same mechanisms that

¹⁴⁷ VCCI and USAID. *Vietnam Provincial Competitiveness Index 2022: Summary Report*. Vietnam Chamber of Commerce and Industry and United States Agency for International Development, 2023. https://www.pcivietnam.vn/uploads/EN-Bao-cau-dai/2022_PCI-Report_Final.pdf

ensure vertical coherence (leadership retreats, performance contracts, and centralized audits) also affect the discretionary space of actors at the margins. The autonomy to experiment, iterate, or reframe innovation priorities at lower administrative levels therefore is incredibly narrow. For example, Rwanda's district-level governments include ICT targets in development plans, but they lack the fiscal and institutional autonomy to pilot or scale local innovation solutions outside national frameworks. In Vietnam, the picture is different but no less complex. The ecosystem is more institutionally diffuse, which theoretically allows for decentralized experimentation. However, limited fiscal devolution, overlapping mandates, and compliance-heavy administrative routines dermine actors' ability to pursue autonomous innovation trajectories. This limits the emergence of bottom-up initiatives that might respond more flexibly to local conditions so room for autonomous change exists in form but lacks the enabling conditions to drive transformative outcomes. But both Rwanda and Vietnam recognize that the ability to innovate is also dependent on material capability. Specifically, mobilizing, allocating, and governing financial and human capital **resources** in ways that are strategically aligned and socially inclusive.

Both countries moderately invest in R&D but are adept at attracting private sector contributions. Vietnam's(2.9) hybrid resource strategy combining public policy anchors with market-based funding (high FDI) has supported signature initiatives, yet there are reports of significant imbalance among geographic regions in innovation funding, skilled talent and infrastructure. The country produces over 400,000 university graduates annually, many in STEM fields, and maintains a dense web of universities and vocational training centers. Yet linkages between these institutions and the innovation system are quite underdeveloped, with low R&D commercialization rates and persistent gaps in research-to-market pathways especially outside main urban centers. Rwanda's(3.1) resource governance is more strategically disciplined, with increasing domestic ownership of development financing, expanded public-private partnerships and human capital growth. Although it has a narrower pool of resources to support its innovation agenda, there is intentional concentration of resource capacity where it is strategically most impactful leading to more regionally competitive outcomes and more equitable access to resources across the country. Still, most districts rely on the central government for their budgets and fiscal autonomy is limited which constrains localized resource adaptability.

The governance structure analysis also reveals that both countries exhibit partial, asymmetrical uptake of PDIA principles, but in very different ways. Rwanda's national innovation strategy is problem-driven in an unambiguous sense: challenges are explicitly identified, and high-level solutions are coordinated through structured, state-led processes. Vision-setting frameworks such as NST1 function as actionable blueprints subjected to routine changes. This contrasts sharply with Vietnam, where national strategies often adopt the language of innovation and reform without establishing rigorous problem-diagnosis protocols. There, problem-driven engagement tends to be declarative not operational. At the local level, however, the pattern inverts somewhat. Vietnam demonstrates greater procedural openness through participatory mechanisms embedded in donor-led programs like the CPRP so there is some degree of community level feedback that is more organic than in Rwanda's central model. *Umuganda* in Rwanda is an important vehicle for local participation, but it functions within a structure that channels local initiative toward national agendas, rather than fostering autonomous problem framing. But Rwanda is more committed to iterative learning where Vietnam struggles with follow-through because of poor systems design for embedding feedback into policy redesign. The table below provides a summary of PDIA expressed across national and local levels in both countries:

PDIA Across National and Local Contexts: Rwanda-Vietnam Comparison

	Rwanda-National	Rwanda-Local	Vietnam-National	Vietnam-Local
Problem-Drive n	Explicit	Community issues solved via Umuganda	Stated but unspecified; broad	Local New Rural Development- CPRP, DPPR
Iterative Adaptation	Pilots and mid-course corrections	State led loops	Limited follow-through	Commune-level feedback through VMG
Local Ownership	No. Highly centralized	Umuganda	Limited; Mostly Top Down	Some at the provincial level
Feedback Mechanism	Bureaucratic	Informal channels	Sparse use of feedback	Community diagnostics
Flexibility and Experiment	Highly structured	Guided by state	Risk averse	Donor and local piloting

(Table 2: Author's own PDIA Rwanda-Vietnam Comparative Table)

6.3 Comparative Effectual Practices and Strategic Improvisation

Both countries have demonstrated that innovation in constrained environments is less about predictive planning and more related to dynamic adaptation which has already been likened to entrepreneurial effectuation strategies in this study. Both countries demonstrate that resource constraints do not inhibit innovation outright but shape how effectuation unfolds.

Comparative Application of Effectuation Principles in Rwanda and Vietnam

Principle	Rwanda	Vietnam
Bird in Hand	Institutionalized use of available means: YouthConnekt, TVET centers, and local cooperatives mobilize underutilized youth capacity and community knowledge.	Resource-driven bootstrapping: Most entrepreneurs rely on personal savings and family networks due to limited access to external capital.
Affordable Loss	Built into policy: eg. BDF provides 50–70% credit guarantees; MBRP offers tax incentives in risky sectors.	Informal practice: Affordable loss is necessary due to weak funding; 69% of startups cite access to finance as a top challenge.
Crazy Quilt	State-curated partnerships: Government brokers collaborations with e.g. Kigali Innovation City, CMU-Africa to co-build innovation capacity.	Emergent, peer-based networks: Incubators and accelerators in urban hubs foster informal partnerships, often without state backing.
Pilot in the Plane	Centralized strategic agency: Long-term visioning (Vision 2020) and adaptive plans (EDPRS, NICI) give government control over national innovation direction.	Founder-led improvisation: Many startups launch without full business plans and adapt rapidly to feedback and regulatory shifts.
Lemonade	Pivots in response to shocks: eg. COVID-era MBRP turned crisis into opportunity via tax breaks, stimulus, and industrial investments.	Market-based adaptation: Sectors like fintech/edtech pivot quickly to survive; 40% of products are new-to-market, 20% new-to-world.

(Table 3: Author's own Effectuation Rwanda-Vietnam Comparative Table)

Rwanda exemplifies what might be called state-structured effectuation. Its use of available means is not left to entrepreneurs alone but institutionalized through national programs. Most initiatives are state-orchestrated and emphasize inclusion while being aimed at building internal capabilities where global capital is less dependable. This reduces failure risk and helps with managing affordable loss, but it also limits peripheral actors to define and pursue their own innovation goals and strategies since there is minimal fiscal decentralization. So the entrepreneurial space is then framed not as a site of freeform exploration but as a mechanism for delivering national development targets through innovation challenges, donor-backed incubators, and national research funds. Vietnam has a more emergent and distributed pattern of effectuation, particularly within its vibrant urban innovation hubs and at the subnational and entrepreneurial levels. But the potential of decentralized effectuation is not fully captured within a national innovation framework that has poor coordination and institutional support for entrepreneurs. Entrepreneurs frequently operate without formal protection, calculating loss based on social capital, family resources, or speed to market. This sharpens improvisational reflexes, but also exposes actors to systemic vulnerabilities without buffers and learning infrastructure. And since entrepreneurs generally bootstrap their venture and rely on peer-based learning and local experimentation, the innovation process often unfolds through informal networks, community mentorship, and iterative problem-solving, with policy frameworks playing a reactive rather than generative role in shaping entrepreneurial outcomes.

The “crazy quilt” arrangements in Rwanda contrastingly, are heavily curated as the state often brokers partnerships and sets thematic boundaries for collaboration. This results in a deliberate but bounded form of network construction where actors are selectively included in government-led platforms, such as the HangaPitchfest or the Rwanda Innovation Fund. Shifts that occur in the entrepreneurial landscape do not emerge spontaneously or from broad feedback but are planned, budgeted, and executed through centralized institutions such as MINICT and RDB. The government’s role as both pilot and planner has also helped it to turn disruption into opportunity—what Sarasvathy would call “making lemonade”. Its innovation governance tends to stabilize uncertainty through planning cycles, policy and centralized coordination such as the rollout of the MBRP during COVID-19. During the pandemic, agility in Vietnam was evident among startups rapidly transitioning to new product lines and service models, with limited state direction but high responsiveness to demand-side volatility. This is common in Vietnam-actors

often experiment locally with tech solutions even before national policy frameworks or institutional support mechanisms are caught up. Effectuation in Vietnam is therefore not strategically bound by policy but it is a survival conditioning for its startup ecosystem. Success in innovation largely depends on the agility of entrepreneurs to navigate market volatility, leverage informal networks, and repurpose limited resources in response to emerging opportunities. Alternatively, in Rwanda the extent to which entrepreneurs can harness state tools like BDF guarantees or how effectively actors align their improvisations, such as pivots during crises with long term national priorities, determine their success in the market.

What is perhaps most telling is how each country treats *successful improvisation*. In Vietnam, successful local adaptations rarely scale unless they attract international attention or external capital due to limited infrastructure, feedback capturing mechanisms and political will to translate grassroots innovation into national best practice. But in Rwanda, scale is often preordained. Promising innovations are rapidly integrated into broader development plans but only if they originate within or are sponsored by formal institutions. Rwanda also actively invests in developing innovation infrastructure statewide and commits to feedback capturing. Political will around STI promotion is strong, consistent and unified across all levels of government. And This means there is a learning asymmetry here: Rwanda's state learns how to scale from within itself, while Vietnam's ecosystem learns by necessity from external feedback and market trial-and-error.

Each case shows a unique way of turning constraint into opportunity through effectual logic. Structure, agency, and pathways for scale differ significantly between the two countries and the success of innovation through effectual strategies is shaped, limited, and enabled by broader governance architectures. Rwanda's approach focused on clarity and coordination through state-structured effectuation, yet it risks stifling localized experimentation. Vietnam's more diffuse, founder-driven approach promotes innovation at the margins, however it often fails at converting it into sustained national impact. The comparative analysis shows that centralized effectuation may deliver coherence and speed, and decentralized effectuation fosters adaptability, but neither model fully resolves the trade-offs between control and emergence that innovation governance in resource-constrained settings navigate.

7: Conclusion and Theoretical Reflections

7.1 Revisiting Hypotheses and Responding to Core Research Question

Having explored how theory travels across contexts and the empirical reality in both countries, this final section returns to the study's guiding research question and hypotheses to summarize research outcomes in brief.

Main Research Question:

How have Rwanda and Vietnam operationalized adaptive governance for innovation in resource-limited contexts between 2000 and 2024 in ways that reflect or extend dominant theoretical frameworks for innovation?

Answer:

Rwanda and Vietnam have operationalized adaptive governance for innovation through distinct yet converging strategies that reflect partial alignment and contextual extension of NIS, Adaptive Governance, and Effectuation frameworks.

- In Rwanda, centralized leadership, tight performance loops (e.g., Imihigo, Umwiherero), and visionary planning and resource management (e.g Vision 2020/2050) were combined with growing bottom-up entrepreneurial activity (e.g., Hanga Hubs, Kigali Innovation City), indicating a state-centric but increasingly pluralistic innovation model. Structures such as Umuganda support PDIA-like principles to drive inclusive governance participation and local initiative.
- In Vietnam, innovation evolved through decentralization, embedded experimentation at provincial levels, and hybrid state-market coordination. While the central government set broad strategic goals, provinces, ministries, and firms engaged in improvisation and problem-solving, in an ad-hoc adaptive, multiscalar governance architecture.
- Both countries demonstrated the co-existence of developing but formal innovation systems (NIS), flexible governance structures (Adaptive Governance), and effectual

practices (Effectuation). However, each framework required local reinterpretation to function effectively under structural constraints.

7.1.1 Reflection on Hypotheses

Hypothesis 1:

Innovation policy in both countries has evolved through iterative feedback and institutional learning, suggesting that adaptive governance mechanisms such as experimentation, decentralization, and mid-course correction are central to innovation success in resource-constrained environments.

Confirmed. Both countries show evidence of iterative, feedback-driven governance. Rwanda's NICI cycles and EDPRS frameworks illustrate double-loop learning and recalibration, while Vietnam's fragmented but iterative pilot models (e.g., tech transfer laws, provincial reforms) embody decentralized problem-solving. These patterns affirm the relevance of Adaptive Governance, particularly the PDIA and ACW models.

Hypothesis 2:

Rather than impeding innovation, the specific contextual conditions of Rwanda and Vietnam—including historical disruptions, governance evolution, and social dynamics—have fostered adaptive policy innovation by instilling resilience, socio-institutional trust, and a culture of experimentation within their governance models—resulting in frameworks that partially reflect but also transcend existing theories.

Strongly Confirmed. Post-genocide reconstruction in Rwanda and post-socialist transition in Vietnam created governance environments characterized by urgency, trust-building, and experimentalism. Both countries selectively adopted global models and infused them with local logics, illustrating how structural adversity can generate institutional creativity. This confirms that existing theories, while useful, underestimate the adaptive and effectual potential of post-crisis states.

Hypothesis 3:

The differences in Rwanda's and Vietnam's innovation trajectories and policy logics—top-down strategic vision versus decentralized institutional learning—suggest that dominant innovation governance theories, while useful for framing, are insufficient to explain the complexity and variability of innovation emergence in the Global South and require reconceptualization to account for non-linear and politically embedded processes.

Confirmed. Both countries benefited from global innovation norms, donor funding, and international networks. But success depended on contextual appropriation. Vietnam localized industrial policy and foreign investment strategies to fit domestic coordination patterns, while Rwanda adapted ICT and e-governance frameworks to local needs and institutions. While NIS provides a useful system-mapping tool, it often assumes mature institutions and ignores informal dynamics. Adaptive Governance accommodates flexibility but needs stronger emphasis on power and legitimacy. Effectuation provides micro-level clarity but requires macro-level institutional scaffolding. Evidence points to the need for hybrid theoretical models that embrace political embeddedness, informal adaptation, and non-linear policy evolution.

7.2 Emergent Insights for Innovation in Resource-Constrained Contexts

This study's comparative analysis of Rwanda and Vietnam through the lenses of National Innovation Systems (NIS), Adaptive Governance, and Effectuation yields a series of additional cross-cutting lessons. These insights are particularly relevant for policymakers, development partners, and scholars seeking to understand how innovation can thrive despite systemic limitations:

Innovation can be effectively driven under constraint if adaptive, iterative, and inclusive models are prioritized.

From an NIS perspective, Rwanda and Vietnam show that innovation systems do not need to emerge organically from advanced industrial or research infrastructures. Instead, innovation ecosystems can be strategically cultivated through sequenced investments in human capital, targeted sectoral planning, and institutional design. Rwanda's technocratic planning and Vietnam's gradual liberalization demonstrate that intentional state-building and innovation systems development can co-evolve, even from weak starting points. The evolution of both

countries' innovation systems reveals the importance of learning-centered governance. Iterative policy planning, decentralized experimentation (Vietnam), and performance contracts with feedback mechanisms (Rwanda) show that adaptive governance offers the procedural flexibility needed to manage innovation in volatile environments. Both countries illustrate the value of building multi-level coordination, institutional memory, and continuous monitoring, aligning closely with the Adaptive Capacity Wheel and PDIA principles.

Strong visioning and coordination structures must be balanced with space for experimentation, decentralization, and informal innovation.

Both Rwanda and Vietnam demonstrate that in resource-constrained settings, a strong and proactive state is often the initial anchor of innovation system development. However, state-led approaches require flexibility and institutional learning mechanisms to adapt to emergent challenges. So in Rwanda's case, state anchoring is essential, but not sufficient. Vietnam's shift from rigid centralization to experimentation at the provincial level contrasts with Rwanda's more centralized, vertically coordinated model. The key is not choosing one over the other, but rather calibrating governance forms based on institutional capacity, trust networks, and the nature of the innovation problem.

Adaptive Governance must include equity, power asymmetries, and informal processes to be relevant in lower-capacity settings.

The role of trust, cultural narratives, and relational governance is especially pronounced in both cases. This reinforces Lundvall's emphasis on learning-by-interacting and supports more recent NIS and Effectuation literature that recognizes social capital and informal networks as key enablers of innovation. In Rwanda, trust in government and in national transformation narratives enabled bold innovation planning. Beyond its practical value in local development and infrastructure upkeep, Umuganda operates as a symbolic and relational platform, through which trust in government and national transformation narratives are deepened. In Vietnam, informal coalitions and tacit knowledge diffusion underpinned system flexibility and localized problem-solving. Both cases suggest that adaptive governance cannot be abstracted from cultural institutions and historical practices that shape how policy is received, negotiated, and implemented on the ground.

Effectuation has strong applicability at the macro level in governance when supported by enabling institutional scaffolding.

While traditionally associated with micro-level entrepreneurial decision-making, this study finds that effectuation also holds significant relevance at the macro level particularly in public governance when institutional scaffolding is in place to support it. In both Rwanda and Vietnam, public institutions and policy actors often pursued innovation by leveraging available means, forming coalitions, adapting to surprises, and co-creating solutions under uncertainty. The presence of enabling structures (trusted public institutions, political legitimacy, performance monitoring systems, and flexible coordination mechanisms) determined the successful outcomes particularly in Rwanda. This challenges earlier critiques that effectuation cannot scale beyond the entrepreneurial domain. Instead, it suggests that governance systems designed for adaptive feedback, coalition-building, and stakeholder co-creation can actively operationalize effectuation as a viable strategy for national innovation.

7.3 Directions for Future Research

While this thesis contributes to deepening our understanding of innovation governance in resource-constrained environments, several limitations and opportunities for future inquiry remain. Future research should broaden the empirical scope to include countries with less successful or stalled innovation systems, particularly across Africa, Southeast Asia, and Latin America, to better understand how governance breakdowns, institutional rigidities, and weak feedback loops constrain innovation. Additionally, the observed macro-level examples of effectuation invite deeper theoretical and empirical work on the development of quantitative or mixed-method tools to measure effectual logic in policy settings, such as affordable-loss budgeting or stakeholder-driven program design. Future research can also enhance the utility of the adaptive governance frameworks used given that current applications of the Adaptive Capacity Wheel and PDIA frameworks were quite qualitative and subjective. Moreover, attention should be given to how institutional learning is preserved or eroded during political transitions or donor shifts, and how adaptive governance and effectual strategies scale or falter at the subnational or grassroots level. Interviews with local entrepreneurs, civil society actors, and policy implementers could enrich understanding of real-time improvisation and governance

agency. Finally, future studies should explore how innovation governance links to inclusive development outcomes, including gender equity, environmental sustainability, and social cohesion.

Bibliography

Akçomak, I. Semih, and Bas ter Weel. “Social Capital, Innovation and Growth: Evidence from Europe.” *European Economic Review* 53, no. 5 (2009): 544–567.

Andrews, M., L. Pritchett, and M. Woolcock. “Escaping Capability Traps Through Problem Driven Iterative Adaptation (PDIA).” *World Development* 51 (2013): 234–244.

Andrews, Matt, Lant Pritchett, and Michael Woolcock. *Building State Capability: Evidence, Analysis, Action*. Oxford: Oxford University Press, 2017.

Arend, Richard J., Hessamoddin Sarooghi, and Andrew Burkemper. “Effectuation as Ineffectual? Applying the 3E Theory-Assessment Framework to a Proposed New Theory of Entrepreneurship.” *Academy of Management Review* 40, no. 4 (2015): 630–651.

Barjum, Daniel, and Matt Andrews. *PDIA to Break Silos and Learn by Doing: A Case Study on the First Stage of Agile Engagement in Croatia’s Digital Health System Policy*. Cambridge, MA: Building State Capability, Harvard Kennedy School, 2021.

Brettel, Malte, René Mauer, Andreas Engelen, and Daniel Küpper. “Corporate Effectuation: Entrepreneurial Action and Its Impact on R&D Project Performance.” *Journal of Business Venturing* 27, no. 2 (2012): 167–184.

Carayannis, Elias G., and David F. J. Campbell. *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems*. New York: Springer, 2012.

Chaffin, Brian C., Hannah Gosnell, and Barbara A. Cosens. “A Decade of Adaptive Governance Scholarship: Synthesis and Future Directions.” *Ecology and Society* 19, no. 3 (2014): 56.

Chandler, Gaylen N., Dawn R. DeTienne, Alexander McKelvie, and Troy V. Mumford. “Causation and Effectuation Processes: A Validation Study.” *Journal of Business Venturing* 26, no. 3 (2011): 375–390.

Datta, Anamika W., and Brian C. Chaffin. “Evolving Adaptive Governance: Challenging Assumptions through an Examination of Fisheries Law in Solomon Islands.” *Ecology and Society* 27, no. 2 (2022): 30.

Dew, Nicholas, Stuart Read, Robert Wiltbank, and Saras D. Sarasvathy. “Effectual versus Predictive Logics in Entrepreneurial Decision-Making: Differences Between Experts and Novices.” *Journal of Business Venturing* 24, no. 4 (2009): 287–309.

Edquist, Charles, ed. *Systems of Innovation: Technologies, Institutions and Organizations*. London: Pinter Publishers, 1997.

Elite Law Firm. “Vietnam Patent Statistics in 2023.” *Law Firm Elite*, February 24, 2024. <https://lawfirmelite.com/vietnam-patent-statistics-in-2023/>.

Fidelman, Pedro, Truong Van Tuyen, Kim Nong, and Melissa Nursey-Bray. “The Institutions–Adaptive Capacity Nexus: Insights from Coastal Resources Co-Management in Cambodia and Vietnam.” *Environmental Science & Policy* 76 (2017): 103–112.

Freeman, Christopher. *Technology Policy and Economic Performance: Lessons from Japan*. London: Pinter Publishers, 1987.

General Statistics Office of Vietnam. “Socio-Economic Situation in the Third Quarter and Nine Months of 2023.” General Statistics Office of Vietnam, October 2023. <https://www.nso.gov.vn/en/data-and-statistics/2023/10/socio-economic-situation-in-the-third-quarter-and-nine-months-of-2023/>.

Gerschenkron, Alexander. *Economic Backwardness in Historical Perspective: A Book of Essays*. Cambridge, MA: Belknap Press of Harvard University Press, 1962.

Gilding, Louise. “Effectuation in Public Policy: A Practitioner’s Reflection.” *Australian Journal of Public Administration* 80, no. 2 (2021): 259–263.

Gupta, Joyeeta, Catrien Termeer, Judith Klostermann, Sandra Meijerink, Mirjam van den Brink, Pier Vellinga, and Jeroen Biermann. “The Adaptive Capacity Wheel: A Method to Assess the Inherent Characteristics of Institutions to Enable the Adaptive Capacity of Society.” *Environmental Science & Policy* 13, no. 6 (2010): 459–471.

Igunza, Emmanuel. “Rwanda Announces Visa-Free Travel for All Africans as Continent Opens Up to Free Movement of People.” *AP News*, November 2, 2023.
<https://apnews.com/article/09edb93691babd5e0cebd2e131fd7ecb>.

ITU DataHub. “Mobile Network Coverage – Rwanda.” ITU, 2025.
<https://datahub.itu.int/data/?e=ZMB&i=100095&s=19306&v=chart>.

Jacobs, Inga M., Ulrike Rivett, and Maria Chemisto. “Developing Capacity through Co-Design: The Case of Two Municipalities in Rural South Africa.” *International Journal of Water Resources Development* 34, no. 5 (2018): 722–738.

Jann, Werner, and Kai Wegrich. “Theories of the Policy Cycle.” In *Handbook of Public Policy Analysis: Theory, Politics, and Methods*, edited by Frank Fischer, Gerald J. Miller, and Mara S. Sidney, 69–88. Boca Raton, FL: CRC Press, 2017.

Johnson, Björn. “Institutional Learning.” In *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, edited by Bengt-Åke Lundvall, 23–44. London: Pinter Publishers, 1992.

Kapepo, Meke, Jean-Paul Van Belle, and Edda Weimann. “WhatsApp as an Improvisation of Health Information Systems in Southern African Public Hospitals: A Socio-Technical Perspective.” *Procedia Computer Science* 256 (2025): 805–815.

Klosterman, Richard E. “Arguments for and Against Planning.” *Town Planning Review* 56, no. 1 (1985): 5–20.

KT Press. “Photos: Rwanda Kicks Off 63 Million Tree Planting Season During Umuganda.” *KT Press*, October 28, 2023.
<https://www.ktpress.rw/2023/10/photos-rwanda-kicks-off-63-million-tree-planting-season-during-umuganda/>.

Lawson, Andrew, and Jamelia Harris. “Is the Problem Driven Iterative Adaptation Approach (PDIA) a Panacea for Public Financial Management Reform? Evidence from Six African Countries.” *World Development Perspectives* 31 (2023): 100526.

Lundvall, Bengt-Åke, ed. *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers, 1992.

McNaught, Tim. *A Problem-Driven Approach to Education Reform: The Story of Sobral in Brazil*. RISE Insight Note 2022/039. March 2022.

https://doi.org/10.35489/BSG-RISE-RI_2022/039.

McWilliams, Edmund. “Vietnam in 1982: Onward into the Quagmire.” *Asian Survey* 23, no. 1 (January 1983): 62–72.

Metcalf, J. Stanley. “Technology Systems and Technology Policy in an Evolutionary Framework.” *Cambridge Journal of Economics* 19, no. 1 (1995): 25–46.

———. “Systems Failure and the Case for Innovation Policy.” In *Innovation Policy in a Knowledge-Based Economy: Theory and Practice*, edited by Patrick Llerena and Mireille Matt, 47–74. Berlin: Springer, 2005.

Ministry of Finance and Economic Planning (MINECOFIN). “Economy Registered 8.2% Growth in 2023.” Republic of Rwanda, January 2024.

<https://www.minecofin.gov.rw/news-detail/economy-registered-82-growth-in-2023>.

Ministry of Local Government (MINALOC). “Empowering Communities Through Umuganda.” *ArcGIS StoryMaps*. Accessed May 20, 2025.

<https://storymaps.arcgis.com/stories/cf9bef2f6f4441d099491ac87d01222a>.

Mozilla Foundation. “Open Voice Success in Rwanda.” *Mozilla Foundation*, August 29, 2019.

<https://foundation.mozilla.org/en/blog/open-voice-success-in-rwanda/>.

National Institute of Statistics of Rwanda (NISR). *Rwanda Establishment Census 2017*. Kigali: NISR, 2018.

<https://www.statistics.gov.rw/datasource/Establishment-Census/establishment-census-2017>.

Nelson, Richard R., ed. *National Innovation Systems: A Comparative Analysis*. New York: Oxford University Press, 1993.

OECD. *Managing National Innovation Systems*. Paris: Organisation for Economic Co-operation and Development, 1999.

OECD. *SME and Entrepreneurship Policy in Viet Nam*. OECD Studies on SMEs and Entrepreneurship. Paris: OECD Publishing, 2021. <https://doi.org/10.1787/30c79519-en>.

Organisation for Economic Co-operation and Development (OECD). *Managing National Innovation Systems*. Paris: OECD Publishing, 1999.

Organisation for Economic Co-operation and Development (OECD) and World Bank. *Science, Technology and Innovation in Viet Nam: OECD Reviews of Innovation Policy*. Paris: OECD Publishing, 2014. <https://doi.org/10.1787/9789264213500-en>

Ostrom, Elinor. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press, 2005.

Papamichail, Theano, and Ana Perić. “Informal Planning: A Tool towards Adaptive Urban Governance.” In *Proceedings of the 55th ISOCARP World Planning Congress 2019*, edited by Mihaela Juvara and Sabine Ledwon, 1–14. The Hague: International Society of City and Regional Planners, 2019.

Paul Nimusima. *Rwanda Economic Performance Overview: A Review of Post-Genocide Economic Recovery*. Jönköping, Sweden: Jönköping University, 2018.
<https://ju.se/download/18.243bd3a4161b08d5c5817099/1520578293273/EARP-EF%202018-17%20Nimusima.pdf>.

Prior, J., T. N. N. Zaw, J. Y. Hassen, and E. Toperesi. “Social Capital, Adaptation and Resilience: Case Studies of Rural Communities in Ethiopia, Zimbabwe and Myanmar.” In *Population, Development, and the Environment*, edited by H. James, 87–112. Palgrave Macmillan, 2019.
https://doi.org/10.1007/978-981-13-2101-6_7.

Ranjan, Udit. “Understanding Problem Driven Iterative Adaptation and Its Limitations.” *Accountability Initiative*, April 5, 2021.
<https://accountabilityindia.in/blog/understanding-problem-driven-iterative-adaptation-and-its-limitations/>.

ReliefWeb. “Rwanda Schools Still Struggling to Recover from 1994 Genocide.” *ReliefWeb*, March 13, 2006.

<https://reliefweb.int/report/rwanda/rwanda-schools-still-struggling-recover-1994-genocide>.

Republic of Rwanda. *National Information and Communication Infrastructure (NICI) Plan 2005*. Kigali: Ministry of Infrastructure, 2000.

Republic of Rwanda. *Vision 2020*. Kigali: Ministry of Finance and Economic Planning, 2000.

Food and Agriculture Organization. *National Strategy for Transformation 2017–2024: Priority Area 1—Economic Transformation*. Ministry of Finance and Economic Planning.
<https://faolex.fao.org/docs/pdf/rwa206814.pdf>.

Reymen, Isabelle M. M. J., Petra Andries, Hans Berends, René Mauer, Ute Stephan, and Elco van Burg. “Understanding Dynamics of Strategic Decision Making in Venture Creation: A Process Study of Effectuation and Causation.” *Strategic Entrepreneurship Journal* 9, no. 4 (2015): 351–379. <https://doi.org/10.1002/sej.1201>.

Rwanda Development Board. *Business Register 2024: Key Statistics on Registered Enterprises*. Kigali: RDB, 2024.

RDB. Annual Report 2022. <https://rdb.rw/reports/RDB-Annual-Report-2022.pdf>.

RDB. Annual Report 2023. <https://rdb.rw/ar/2023-RDB-AR.pdf>.

Rwanda Governance Board (RGB). *Impact Assessment of Umuganda: 2007–2016*. Kigali: RGB, 2016.

https://www.rgb.rw/fileadmin/user_upload/RGB/Publications/HOME_GROWN_SOLUTIONS/Impact_Assessment_of_Umuganda_2007-2016.pdf.

Rwanda Governance Board. *Rwanda Governance Scorecard (RGS), 9th Edition*. Kigali, 2022. Accessed 2023.

https://e-ihuriro.rcsprwanda.org/wp-content/uploads/2023/06/RGS_9th_Edition.pdf.

Sarasvathy, Saras D. “Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency.” *Academy of Management Review* 26, no. 2 (2001): 243–263.

Smith Coyoli, Julia. “Education Reform and Teachers’ Unions in Mexico.” *ReVista: Harvard Review of Latin America*, November 3, 2022.
<https://revista.drclas.harvard.edu/education-reform-and-teachers-unions-in-mexico/>.

Soete, Luc, Bart Verspagen, and Bas ter Weel. “Systems of Innovation.” *MERIT Working Paper* 2009-062. United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT), 2009.

Teixeira, Aurora A. C. “National Systems of Innovation: A Bibliometric Appraisal.” *FEP Working Papers* no. 271 (April 2008).
https://www.researchgate.net/publication/24111655_National_Systems_of_Innovation_a_bibliometric_appraisal.

Transparency International. *Corruption Perceptions Index 2024*. Berlin: Transparency International, 2024. <https://www.transparency.org/en/cpi/2024/index/vnm>.

UNDP Rwanda. *YouthConnekt Africa Hub Annual Report 2022*. Kigali: UNDP, 2023.
<https://www.youthconnekt africa.org/sites/default/files/2021%20Annual%20Report.pdf>.

UNESCO Institute for Statistics (UIS). *Research and Development Expenditure (% of GDP)*. World Bank Data. Accessed April 5, 2025.
<https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

VCCI and USAID. *Vietnam Provincial Competitiveness Index 2022: Summary Report*. Vietnam Chamber of Commerce and Industry and United States Agency for International Development, 2023. https://www.pcivietnam.vn/uploads/EN-Bao-cao-dai/2022_PCI-Report_Final.pdf.

Wiltbank, Robert, Stuart Read, Nicholas Dew, and Saras D. Sarasvathy. “Prediction and Control under Uncertainty: Outcomes in Angel Investing.” *Journal of Business Venturing* 24, no. 2 (2009): 116–133. <https://doi.org/10.1016/j.jbusvent.2008.02.00>.

World Bank. *High-Technology Exports (Current US\$) – Vietnam*. Accessed May 6, 2025.
<https://data.worldbank.org/indicator/TX.VAL.TECH.CD?locations=VN>.

World Bank. *Literacy Rate, Adult Total (% of People Ages 15 and Above) – Rwanda*. Accessed May 6, 2025. <https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?locations=RW>.

World Bank. *Scaling up Access to Electricity: The Case of Rwanda*. Washington, DC: World Bank, 2011.
<https://openknowledge.worldbank.org/entities/publication/5e644f08-7927-5a01-90af-1c1522a53071>.

World Intellectual Property Organization (WIPO). *Global Innovation Index 2024*.
<https://www.wipo.int/gii-ranking/en>.

Yongabo, Parfait, and Bo Göransson. “Constructing the National Innovation System in Rwanda: Efforts and Challenges.” *Innovation and Development* 12, no. 1 (2020): 1–22.
<https://doi.org/10.1080/2157930X.2020.1846886>.