

WORKING PAPER

No. 7 | November 2025

Governance Efficacy as a Hybrid Good: Integrating AI, Foresight, and Digital Nudging for Smart Growth

E. Carayannis and N. Rigert Zota



HELLENIC REPUBLIC
National and Kapodistrian
University of Athens
DEPARTMENT OF ECONOMICS



HELLENIC REPUBLIC
National and Kapodistrian
University of Athens
DEPARTMENT OF ECONOMICS

**Governance Efficacy as a Hybrid Good:
Integrating AI, Foresight, and Digital Nudging
for Smart Growth**

**Elias G. Carayannis, GWU,
Washington, DC, 20052, USA, caraye@gwu.edu**

**Nikos - Rigert Zota, University of the Aegean,
Samos, Greece, zotasnikos96@gmail.com**

Working Paper
**International Economics and Development Laboratory (IEDL),
University of Athens, Greece**

November 4, 2025

ABSTRACT

This paper advances a conceptual reframing of governance efficacy as a hybrid public–private good, co-produced through the convergence of Artificial Intelligence (AI), Strategic Foresight, and Digital Nudging. It argues that in the digital era, governance efficacy transcends traditional notions of bureaucratic performance to become a systemic capacity grounded in anticipation, adaptability, and ethical legitimacy. Through an integrated framework, the paper elucidates how AI enhances cognitive intelligence and responsiveness, foresight institutionalizes long-term preparedness and resilience, and digital nudging aligns behavioral engagement with collective values. Together, these enablers form a triadic architecture of “intelligent governance” that links technological capability with public purpose. The analysis applies the TP³ (Theories–Policies–Practices–Politics) lens to trace how hybrid governance operates across institutional layers and sectoral contexts, from public administrations and corporate foresight systems to cross-sectoral partnerships. Comparative illustrations demonstrate that hybrid governance efficacy is not merely an administrative function but an emergent outcome of co-evolution between human and technological intelligence. The study contributes to governance theory by redefining efficacy as a dynamic, ethically grounded, and anticipatory capacity that underpins smart growth, resilience, and sustainable societal transformation.

Keywords: Hybrid Governance, Governance Efficacy, Artificial Intelligence (AI), Strategic Foresight, Digital Nudging, Smart Growth, Adaptive and Anticipatory Governance

JEL Classification: H83, O33, D78, L86, Z18.

1. Introduction: Reframing Governance Efficacy in the Digital Era

The accelerating digital transformation of societies, economies, and institutions is reshaping how governance is designed, implemented, and perceived. Artificial Intelligence (AI), data-driven systems, and algorithmic decision-making are no longer peripheral tools but core infrastructures that redefine state capacity, market behavior, and citizen engagement. In parallel, the proliferation of strategic foresight and behavioral insights methodologies enables governments and organizations to anticipate disruption and guide collective action with greater adaptability. Within this evolving ecosystem, governance efficacy—the ability of systems to deliver legitimate, transparent, and adaptive decision-making—emerges as a hybrid good: simultaneously public in its purpose and private in its mechanisms.

Traditionally, governance has been conceptualized as a public domain function, oriented toward social welfare, equity, and regulatory control. Yet, in the digital age, governance practices increasingly depend on private-sector technologies, platforms, and data ecosystems. This convergence blurs the once-clear boundary between public authority and private capability, giving rise to new hybrid forms of governance that rely on cross-sector collaboration, technological interdependence, and distributed accountability. Public institutions now depend on private digital infrastructures (such as AI analytics, cloud computing, and behavioral data systems) to maintain administrative efficiency and policy responsiveness. Conversely, private actors engage in quasi-public governance through corporate foresight, ESG reporting, and algorithmic transparency frameworks that shape collective norms and behaviors. Governance efficacy, therefore, cannot be understood solely within the confines of state functionality—it must be redefined as a co-produced capacity across the public–private continuum.

The digital era amplifies this hybridity through three interlinked enablers: AI, strategic foresight, and digital nudging. AI introduces predictive, real-time, and adaptive capabilities into decision-making, allowing both governments and firms to manage complexity and uncertainty. Strategic foresight institutionalizes anticipatory intelligence—enabling long-term thinking and scenario-based preparedness amid accelerating technological change. Digital nudging, in turn, operates at the behavioral interface of

governance, using design and data to influence individual and collective choices toward socially desirable or strategic outcomes. Together, these mechanisms constitute an emerging “intelligent governance infrastructure” that underpins smart growth and adaptive policy ecosystems. Their integration reflects a paradigmatic shift from static regulation to dynamic co-creation—where governance efficacy depends not only on authority and compliance, but also on learning, participation, and digital trust.

However, despite their potential, the convergence of AI, foresight, and digital nudging raises critical theoretical and normative questions. How can governance efficacy be maintained in a context where decision power and data ownership are distributed between public and private actors? What are the implications of algorithmic and behavioral governance for accountability, transparency, and legitimacy? To what extent can hybrid governance models foster not only efficiency but also ethical, inclusive, and anticipatory decision systems? Addressing these questions requires a conceptual rethinking of governance efficacy—moving beyond administrative performance metrics toward a systemic, multi-actor, and anticipatory understanding of governance as a hybrid public/private good.

This working paper contributes to this redefinition by proposing an integrated conceptual framework that links AI, strategic foresight, and digital nudging as mutually reinforcing enablers of governance efficacy and smart growth. By situating governance within a hybrid ecosystem perspective, it bridges theoretical discussions on public value, institutional innovation, and socio-technical transformation. The paper argues that governance efficacy in the digital age depends on three core capacities: (a) anticipatory capacity, the ability to detect emerging challenges and opportunities through foresight and AI analytics; (b) adaptive capacity, the ability to adjust institutional structures and policies dynamically; and (c) ethical capacity, the ability to ensure fairness, transparency, and accountability across technological systems. Together, these capacities form the foundation for a more responsive and resilient model of governance that aligns with the principles of smart growth—innovation-driven, socially inclusive, and sustainability-oriented development.

The structure of the paper proceeds as follows. Section 2 reviews the theoretical foundations of governance efficacy and examines the role of AI, foresight, and nudging within emerging models of hybrid governance.

Section 3 introduces the conceptual framework, outlining the integrative mechanisms through which these enablers interact to enhance governance outcomes. Section 4 situates the framework within the TP³ (Theories–Policies–Practices–Politics) lens to explore its implications across institutional, organizational, and political domains. Section 5 provides comparative illustrations from public and private sectors, highlighting hybrid governance practices in diverse contexts. Section 6 discusses theoretical and policy implications for smart growth, and Section 7 concludes with insights for future research and governance design.

By reframing governance efficacy through a hybrid, AI-enabled, and foresight-informed lens, this paper positions governance not merely as a bureaucratic or regulatory function, but as an evolving capability system—a collective intelligence that bridges technology, foresight, and behavioral insight to navigate complexity and drive sustainable, adaptive growth.

2. Conceptual Background and Theoretical Foundations

2.1. Governance Efficacy as a Hybrid (Public/Private) Good

Governance efficacy refers to the capacity of institutions, organizations, and systems to achieve public objectives effectively, ethically, and adaptively. In the digital era, this efficacy can no longer be attributed exclusively to state institutions or bureaucratic performance. It arises from complex interdependencies between public authorities, private actors, civil society, and technological infrastructures. As such, governance efficacy increasingly resembles a hybrid good—a form of collective capacity that embodies both public and private value logics [1].

From a classical perspective, public goods are characterized by non-excludability and non-rivalry, meaning that all individuals benefit from them and no one can be excluded from their use. Private goods, conversely, are governed by property rights, competition, and exclusivity. Governance efficacy does not fit neatly into either category. It depends on shared infrastructures, co-created knowledge, and trust-based networks that transcend institutional boundaries. For instance, digital governance platforms, open data ecosystems, and AI-driven regulatory tools are frequently designed and maintained by private companies but serve public purposes such as transparency, efficiency, or environmental monitoring. Similarly, public agencies often rely on private datasets and machine

learning models to enhance their decision-making capabilities [2]. This symbiotic relationship between public purpose and private innovation exemplifies governance efficacy as a hybrid good—a co-produced outcome sustained by both state legitimacy and market efficiency.

The hybrid nature of governance also reflects a shift from hierarchical command structures to networked and collaborative forms of regulation. Modern governance is increasingly enacted through partnerships, standards, and shared infrastructures rather than through direct control. The notion of hybrid governance captures this interdependence, emphasizing the collective management of public challenges through cross-sectoral cooperation [3]. Within this paradigm, efficacy is no longer measured solely by policy compliance or service delivery, but by the system's capacity to learn, adapt, and generate legitimacy in an environment of continuous technological and social change.

This reconceptualization also brings forward the normative dimension of governance. Hybrid systems must balance efficiency and innovation—typically associated with private actors—with fairness, inclusiveness, and accountability—traditionally linked to public governance. As digital systems increasingly mediate public life, achieving this balance becomes both a functional and ethical imperative. Governance efficacy, therefore, is not only about performance but about how authority and responsibility are distributed and exercised within socio-technical systems.

2.2. AI, Strategic Foresight, and Digital Nudging as Governance Enablers

The transformation of governance efficacy in the 21st century is deeply intertwined with the rise of intelligent technologies and behavioral design. Three interrelated enablers—Artificial Intelligence (AI), Strategic Foresight, and Digital Nudging—collectively shape the architecture of hybrid governance systems, each addressing a distinct but complementary dimension of decision-making: computational intelligence, anticipatory capacity, and behavioral influence [4].

Artificial Intelligence (AI) introduces a new epistemic foundation for governance. By leveraging predictive analytics, natural language processing, and algorithmic learning, AI enhances the ability of both public and private institutions to process complex information, identify patterns,

and optimize decisions [5]. In governance contexts, AI enables predictive policy-making, real-time crisis response, and data-driven regulation. It transforms bureaucratic efficiency into algorithmic adaptability—shifting governance from reactive compliance to proactive optimization. Yet, this transformation also raises concerns about algorithmic bias, accountability, and transparency. AI's contribution to governance efficacy thus depends not only on its technical capabilities but on the institutional and ethical frameworks that regulate its use. In hybrid settings, public oversight and private innovation must co-evolve to ensure that AI systems serve collective interests rather than narrow efficiency goals [6].

Strategic Foresight complements AI by adding a long-term, human-centered dimension to governance. Whereas AI deals with data from the past and present, foresight engages with the uncertainty of the future. Through scenario planning, trend analysis, and anticipatory governance practices, foresight equips decision-makers with the ability to imagine, assess, and prepare for alternative futures [7]. It institutionalizes anticipatory intelligence—the capacity to detect weak signals, understand systemic interdependencies, and design resilient pathways in the face of disruption. When embedded into governance systems, foresight acts as a counterbalance to short-termism, supporting policies that are not only efficient but also sustainable and ethically grounded [8]. Its value becomes even more pronounced in hybrid governance, where public and private actors must align their strategic visions and coordinate across different time horizons.

Digital Nudging, finally, operates at the behavioral interface of governance. Rooted in behavioral economics and human–computer interaction, nudging leverages subtle design cues, framing effects, and choice architectures to influence individual or collective behavior without coercion [9]. In digital environments, nudges can take the form of personalized notifications, default settings, or feedback loops that encourage desired actions—such as sustainable consumption, tax compliance, or civic participation [10]. When applied responsibly, digital nudging enhances governance efficacy by bridging the gap between policy intent and citizen behavior. However, its integration into hybrid governance introduces ethical tensions around autonomy, manipulation, and data privacy [10]. Therefore, digital nudging requires transparent

design principles and accountability mechanisms to ensure alignment with democratic and ethical standards.

Together, AI, foresight, and nudging form a triadic structure of governance enhancement: AI provides cognitive capacity, foresight provides temporal vision, and nudging provides behavioral traction. Their interplay enables governance systems to become more intelligent, adaptive, and participatory—attributes essential for achieving smart growth in complex socio-technical landscapes. This triadic relationship also underlines a critical insight: governance efficacy is not the outcome of any single technology or method, but of their integration into coherent institutional, ethical, and behavioral architectures.

2.3. Linking to Theories of Smart Growth and Institutional Innovation

The hybridization of governance is deeply linked to broader theories of smart growth and institutional innovation. Smart growth emphasizes development that is sustainable, knowledge-intensive, and inclusive. It moves beyond economic metrics to integrate environmental sustainability, social equity, and technological progress. Within this framework, governance efficacy becomes a key determinant of success: it ensures that innovation contributes to societal wellbeing rather than exacerbating inequality or environmental degradation [11]. Hybrid governance, supported by AI, foresight, and nudging, thus represents a governance infrastructure for smart growth—one that blends the agility of markets with the ethical orientation of public policy.

From an institutional perspective, this transformation aligns with theories of adaptive governance and neo-institutionalism. Adaptive governance conceptualizes institutions as evolving systems capable of learning and self-correction in response to environmental feedback. AI and foresight operationalize this adaptiveness, enabling institutions to detect and respond to change dynamically [12]. Neo-institutionalism, meanwhile, highlights the role of legitimacy, norms, and cognitive frames in shaping institutional behavior. Digital nudging can be seen as a micro-level mechanism through which institutional logics translate into individual actions, reinforcing or challenging prevailing governance norms.

At the macro level, the TP³ framework—Theories, Policies, Practices, and Politics—offers a useful lens for connecting these elements. It underscores that governance efficacy emerges not merely from technical solutions but from the interaction between theoretical paradigms, policy design, practical implementation, and political negotiation. Hybrid governance must therefore be understood as both an analytical and normative construct: it describes how governance works in digitally networked societies, but also prescribes how it should work to promote collective resilience and ethical smart growth [13].

3. Conceptual Framework: Integrating AI, Foresight, and Nudging within Hybrid Governance

The preceding sections established that governance efficacy in the digital era cannot be confined within the traditional boundaries of state authority or market rationality. Instead, it emerges as a dynamic property of hybrid governance ecosystems in which multiple actors, technologies, and institutional logics interact. This section develops a conceptual framework for understanding how artificial intelligence (AI), strategic foresight, and digital nudging function as interdependent enablers of governance efficacy, and how their integration underpins the pursuit of smart growth.

3.1. Analytical Premise: Governance as a Multi-Actor Ecosystem

Governance efficacy in contemporary societies is increasingly determined by the ability of diverse actors to collaborate, co-produce knowledge, and adapt to change. Hybrid governance captures this complexity by recognizing that neither governments nor private entities can address systemic challenges—such as climate change, digital ethics, or economic resilience—independently. Public institutions contribute legitimacy, regulatory authority, and equity goals, while private actors supply technological innovation, efficiency, and operational flexibility. Between them operate hybrid intermediaries—think tanks, NGOs, data collaboratives, innovation hubs—whose function is to translate between public purpose and private capacity [14].

This interdependence creates a multi-actor governance ecosystem that resembles a socio-technical network rather than a hierarchical bureaucracy. Governance efficacy, within such an ecosystem, is defined less by control and more by coordination, information flow, and feedback learning.

Accordingly [15], the conceptual framework positions governance as an adaptive system where AI, foresight, and nudging act as complementary mechanisms that enhance the system’s collective intelligence, anticipatory capacity, and behavioral alignment.

3.2. Core Dimensions of the Framework

Each of the three enablers contributes a distinct function within hybrid governance, yet their true potential unfolds when they operate in synergy.

Together, these dimensions form a triadic configuration of governance capacity: intelligence (AI), anticipation (foresight), and behavioral adaptation (nudging). Their integration enables governance systems to operate simultaneously at the informational, strategic, and behavioral levels—creating what can be described as an intelligent governance ecosystem. This ecosystem is characterized by recursive feedback loops where data inform foresight, foresight guides behavioral strategies, and behavioral outcomes generate new data for learning.

Table 1 Interlinked Governance Enablers and Their Expected Outcomes in Hybrid Systems

Dimension	Core Function	Expected Governance Outcome	Dimension
Artificial Intelligence	Enhances cognitive capacity through data analytics, automation, and predictive modelling.	Efficiency, responsiveness, and evidence-based decision-making.	Artificial Intelligence
Strategic Foresight	Expands temporal and strategic vision, fostering anticipatory and long-term planning.	Preparedness, resilience, and policy coherence.	Strategic Foresight
Digital Nudging	Influences behavioral patterns and	Legitimacy, inclusiveness, and	Digital Nudging

fosters citizen or organizational engagement.	behavioral alignment.
---	--------------------------

3.3. Mechanisms of Interaction

The conceptual framework identifies three key mechanisms through which AI, foresight, and digital nudging interact within hybrid governance systems.

First, complementarity: AI provides the empirical and analytical foundation for foresight by processing vast datasets to identify emerging patterns or weak signals, which foresight practitioners then interpret within strategic and normative contexts. In turn, foresight defines the parameters of AI deployment by orienting algorithmic goals toward long-term societal outcomes rather than short-term efficiency metrics. Digital nudging operationalizes these insights by translating policy and foresight objectives into behavioral interventions that engage citizens or organizations directly.

Second, feedback loops: hybrid governance systems depend on continuous learning cycles in which data collection, analysis, forecasting, and behavioral response are linked in iterative sequences. For example, AI-generated insights may inform foresight-driven policy scenarios; those scenarios, once implemented through behavioral design or communication strategies, produce new behavioral data that feed back into AI models. These recursive loops enable governance systems to adjust dynamically and maintain efficacy in volatile or uncertain environments.

Third, hybrid value creation: AI, foresight, and nudging together facilitate a mode of value creation that transcends the public–private divide. They enable co-production of knowledge (through data and foresight collaboration), co-governance of societal challenges (through participatory foresight and behavioral engagement), and co-innovation of solutions (through adaptive technological infrastructures). Hybrid value creation thus becomes the organizing principle of governance efficacy, reflecting both efficiency (private logic) and legitimacy (public logic) in a mutually reinforcing balance.

3.4. Governance Efficacy as Outcome

In this framework, governance efficacy is conceived as an emergent outcome of the coordinated interaction between the three enablers. It represents a system's capacity to anticipate, adapt, and act ethically under conditions of uncertainty. Conceptually, governance efficacy encompasses three interlinked capacities:

1. ***Anticipatory capacity***: the ability to foresee emerging challenges through the integration of AI analytics and strategic foresight tools.
2. ***Adaptive capacity***: the institutional agility to adjust policies, structures, and decision processes based on real-time insights and behavioral feedback.
3. ***Ethical capacity***: the normative competence to ensure that digital, algorithmic, and behavioral interventions are transparent, fair, and accountable.

These capacities reinforce one another through continuous cycles of sensing (AI), envisioning (foresight), and steering (nudging). In effect, governance efficacy is both a state of institutional performance and a process of collective learning. It evolves as hybrid systems mature and as the interplay between technological and social intelligence becomes more sophisticated.

A conceptual diagram representing this model would depict three overlapping circles—AI, foresight, and nudging—intersecting at the core, where governance efficacy resides. The intersections between each pair of dimensions signify specific functional synergies: AI and foresight (anticipatory analytics), foresight and nudging (strategic alignment of behavior), AI and nudging (personalized feedback and optimization). The central convergence point embodies hybrid governance efficacy as a dynamic equilibrium of intelligence, anticipation, and legitimacy.

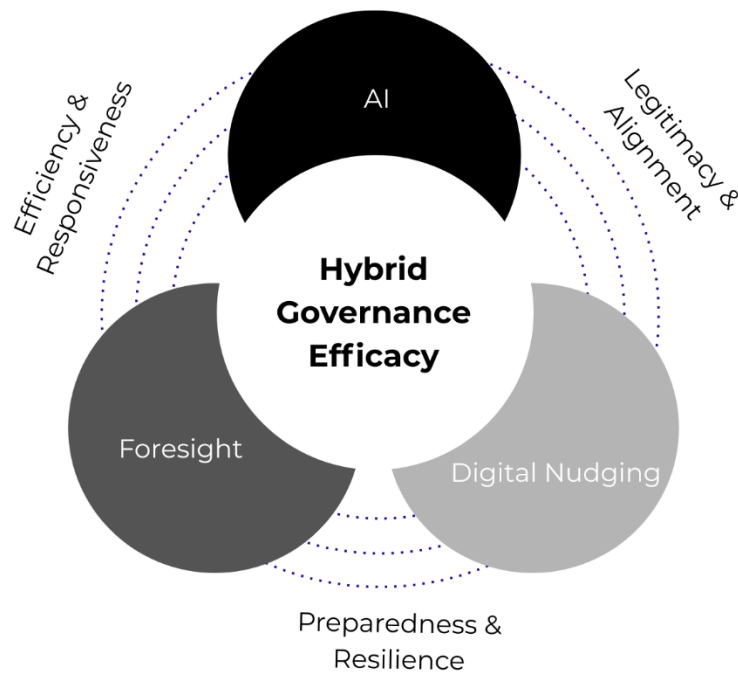


Figure 1 Conceptual Framework for Hybrid Governance Efficacy.

3.5. Conceptual Propositions

Building on the above synthesis, three conceptual propositions are proposed to guide further theoretical and empirical exploration:

P1. Governance efficacy in the digital era increases when artificial intelligence, strategic foresight, and digital nudging are institutionally integrated into the decision-making process rather than applied in isolation.

P2. The hybridization of governance—through cross-sectoral collaboration and co-created technological infrastructures—enhances both the efficiency and legitimacy of policy outcomes.

P3. Smart growth depends on the development of governance ecosystems that are simultaneously data-informed, foresight-oriented, and behaviorally engaged, fostering resilience and ethical adaptability.

These propositions outline a theoretical pathway for understanding hybrid governance efficacy as a multidimensional construct shaped by technological intelligence, anticipatory strategy, and behavioral insight. They also provide a foundation for future comparative research and policy experimentation aimed at institutionalizing hybrid governance mechanisms within diverse contexts.

4. Theories, Policies, Practices, and Politics (TP³) in Action

The TP³ (Theories–Policies–Practices–Politics) framework offers an integrative lens through which to examine how governance efficacy operates within complex, hybrid systems. It highlights that governance is not a static structure, but a dynamic process shaped by ideas, institutional arrangements, operational mechanisms, and power relations. Each layer of TP³ captures a distinct dimension of hybrid governance: theories articulate conceptual foundations; policies provide normative direction; practices operationalize ideas into real-world mechanisms; and politics defines the legitimacy and contestation surrounding their implementation. Together, these dimensions offer a holistic understanding of how artificial intelligence, foresight, and digital nudging collectively transform governance efficacy and enable smart growth.

4.1. Theoretical Layer: Reframing Governance through Adaptive and Anticipatory Lenses

At the theoretical level, hybrid governance efficacy redefines how we understand authority, rationality, and collective decision-making in the digital age. Traditional governance theories, such as bureaucratic rationalism and new public management, are increasingly insufficient to capture the distributed, data-driven, and anticipatory nature of modern governance ecosystems [16]. Instead, new theoretical paradigms—adaptive governance, networked governance, and anticipatory governance—provide more appropriate analytical tools.

Adaptive governance theory emphasizes learning, flexibility, and feedback mechanisms within complex systems [17]. It views institutions as evolving entities capable of adjusting to environmental uncertainty. Within this paradigm, AI acts as a cognitive extension of governance, providing real-time feedback and data-driven learning loops, while foresight contributes a temporal dimension that enables proactive rather than reactive adaptation. Digital nudging, in turn, supports behavioral alignment across stakeholders, reinforcing system coherence without resorting to coercive measures.

Anticipatory governance extends this reasoning by embedding foresight into the core of policymaking. It focuses on preparing institutions to deal with uncertain futures through scenario planning, early warning systems,

and long-term strategic thinking [19]. By integrating AI into anticipatory governance, predictive analytics complement qualitative foresight, enabling the identification of emerging risks and opportunities at greater scale and precision [18]. The theoretical contribution of this synthesis lies in recognizing governance efficacy not as a static indicator of institutional performance, but as a dynamic process of anticipation, adaptation, and learning.

From a hybrid governance perspective, this theoretical integration implies that public and private actors co-produce not only policies and services but also epistemic foundations—shared understandings of what constitutes valid knowledge, credible foresight, and ethical behavior. Thus, theory becomes a site of co-creation, where concepts such as transparency, trust, and legitimacy are continuously renegotiated between public institutions and private technological systems [19].

4.2. Policy Layer: Designing Ethical and Foresight-Oriented Governance Systems

The policy dimension translates theoretical insights into institutional norms, frameworks, and regulatory architectures. In the hybrid governance paradigm, policies must simultaneously foster innovation and safeguard public value, a balance that requires embedding ethics, foresight, and inclusivity into policy design [20].

AI governance policies exemplify this duality. On one hand, they aim to enable innovation by promoting experimentation, data sharing, and algorithmic efficiency. On the other, they must regulate risks related to bias, opacity, and power asymmetry. The challenge lies in ensuring that AI deployment serves collective interests rather than reinforcing institutional or corporate dominance. Ethical AI frameworks, such as transparency by design, accountability auditing, and explainability protocols, play a critical role in maintaining governance efficacy by institutionalizing public trust.

Foresight-based policymaking offers another route toward resilient governance. By integrating foresight units within public administrations, governments can institutionalize long-term thinking and scenario analysis. The European Union’s approach to “anticipatory innovation governance,” for instance, demonstrates how strategic foresight can be linked to evidence-based policy cycles [21]. In hybrid contexts, such policies require

collaboration between public foresight institutions and private analytics providers to align technological capabilities with social priorities. Foresight-oriented policies also encourage participatory mechanisms—such as citizen assemblies and multi-stakeholder dialogues—to democratize future-oriented decision-making.

Digital nudging policies, meanwhile, address the behavioral dimension of governance. Governments and organizations increasingly use behavioral insights to design interventions that encourage pro-social behavior, improve compliance, or promote sustainability [22]. However, without clear ethical frameworks, such interventions risk undermining autonomy and informed consent. Thus, policies governing digital nudging must establish safeguards for transparency, user choice, and data privacy. A well-designed nudging policy balances behavioral effectiveness with normative legitimacy, ensuring that governance efficacy is achieved through persuasion and participation rather than manipulation [23].

In essence, the policy layer of hybrid governance efficacy is characterized by normative hybridity: the coexistence of efficiency-driven, innovation-oriented objectives with value-based, ethical commitments. Effective governance policies in this paradigm must not only regulate technology but also shape its direction toward anticipatory, inclusive, and sustainable outcomes.

4.3. Practice Layer: Institutional Experimentation and Organizational Learning

At the practical level, governance efficacy is enacted through the daily operations of institutions, networks, and technologies. Hybrid governance manifests in the proliferation of experimental practices that blend public and private resources, expertise, and infrastructures. These practices illustrate how AI, foresight, and nudging can be embedded into organizational routines and decision-making processes.

Public innovation labs, foresight units, and behavioral insight teams represent key institutional innovations in this regard. These entities act as boundary organizations that mediate between sectors and disciplines. For example, foresight units within governments engage in horizon scanning and scenario planning to anticipate societal transformations, while behavioral teams design and test digital interventions to enhance citizen

engagement [26]. AI analytics units complement these by providing real-time monitoring and predictive insights that inform both foresight exercises and behavioral experiments. The integration of these practices generates a continuous learning cycle within institutions: data informs foresight, foresight shapes interventions, and interventions produce new data for evaluation.

Private organizations contribute to this ecosystem by adopting corporate foresight and ethical AI principles in their governance structures. Multinational firms increasingly integrate long-term scenario planning into strategic management and apply AI-driven decision-support systems for risk assessment and sustainability tracking. Through public–private collaborations, such practices spill over into the public domain, enabling co-learning and shared value creation.

Hybrid governance practices are also marked by technological infrastructures that facilitate collaboration and transparency. Digital platforms for participatory policymaking, data sharing, and open innovation enable multi-stakeholder interaction at unprecedented scale. When combined with foresight methodologies and behavioral insights, these platforms become engines of distributed governance intelligence. They allow continuous feedback from citizens, real-time evaluation of policy performance, and iterative policy redesign—all essential features of governance efficacy.

Nevertheless, practice-level implementation faces persistent challenges. Institutional inertia, data silos, and conflicting incentives can hinder hybrid learning. Moreover, the translation of AI and foresight insights into actionable policy remains constrained by organizational capacity and political will. Hence, governance efficacy at the practice level depends on cultivating organizational cultures of experimentation, reflexivity, and ethical responsibility—qualities that align closely with the principles of smart growth.

4.4. Political Layer: Power, Legitimacy, and the Ethics of Hybrid Governance

The political dimension of TP³ addresses the underlying power structures, legitimacy dynamics, and ethical dilemmas that shape hybrid governance systems. As governance efficacy becomes increasingly reliant on private

technological infrastructures and behavioral interventions, questions of accountability and democratic oversight gain prominence.

One of the central political tensions concerns the redistribution of power between public institutions and private technology providers. AI-driven decision-making and algorithmic management tools grant unprecedented influence to private entities that design and control data infrastructures. This creates risks of regulatory capture, opacity, and dependency, potentially undermining public sovereignty. Hybrid governance must therefore establish mechanisms for democratic accountability, such as algorithmic transparency requirements, participatory audits, and public oversight boards. These mechanisms ensure that technological power remains subject to societal scrutiny.

Legitimacy is another cornerstone of governance efficacy at the political level. In hybrid governance, legitimacy is no longer derived solely from legal authority but from perceived trustworthiness and performance. Citizens and stakeholders evaluate governance not only by its outcomes but also by the fairness, inclusiveness, and transparency of its processes. Digital nudging, for example, can enhance legitimacy when used to promote civic participation and sustainability, but it can erode trust if perceived as manipulative. Similarly, foresight-based policymaking strengthens legitimacy by engaging diverse stakeholders in shaping long-term visions, thus democratizing the future.

Ethics constitutes the normative backbone of hybrid governance politics. As governance becomes technologically mediated, ethical principles such as autonomy, justice, and accountability must be explicitly encoded into design and implementation processes. AI ethics frameworks, participatory foresight practices, and transparent nudging policies collectively contribute to what might be termed ethical governance efficacy—a form of legitimacy grounded in moral rather than procedural compliance.

Finally, hybrid governance redefines the relationship between politics and expertise. The infusion of AI and foresight into decision-making creates technocratic tendencies, where authority derives from data and predictive models rather than deliberative consensus. While such tendencies can enhance efficiency, they risk marginalizing democratic deliberation. A politically sustainable model of governance efficacy must therefore

balance expert-driven intelligence with participatory engagement, ensuring that technological sophistication coexists with social legitimacy.

4.5. Synthesis: TP³ as a Systemic View of Governance Efficacy

When examined through the TP³ lens, governance efficacy emerges as a systemic property that depends on coherence across all four dimensions. Theoretical clarity ensures that hybrid governance is conceptually grounded; policy frameworks institutionalize ethics and foresight; practical experimentation operationalizes learning and innovation; and political accountability safeguards legitimacy and trust. Misalignment among these dimensions—such as advanced AI policies without ethical oversight, or participatory rhetoric without genuine inclusion—undermines governance efficacy as a hybrid good.

Thus, the TP³ perspective emphasizes that hybrid governance is not only about integrating technologies but about orchestrating ideas, norms, and power relations toward collective resilience and smart growth. Governance efficacy, in this sense, becomes a multidimensional outcome of alignment among theoretical innovation, policy design, institutional practice, and political ethics.

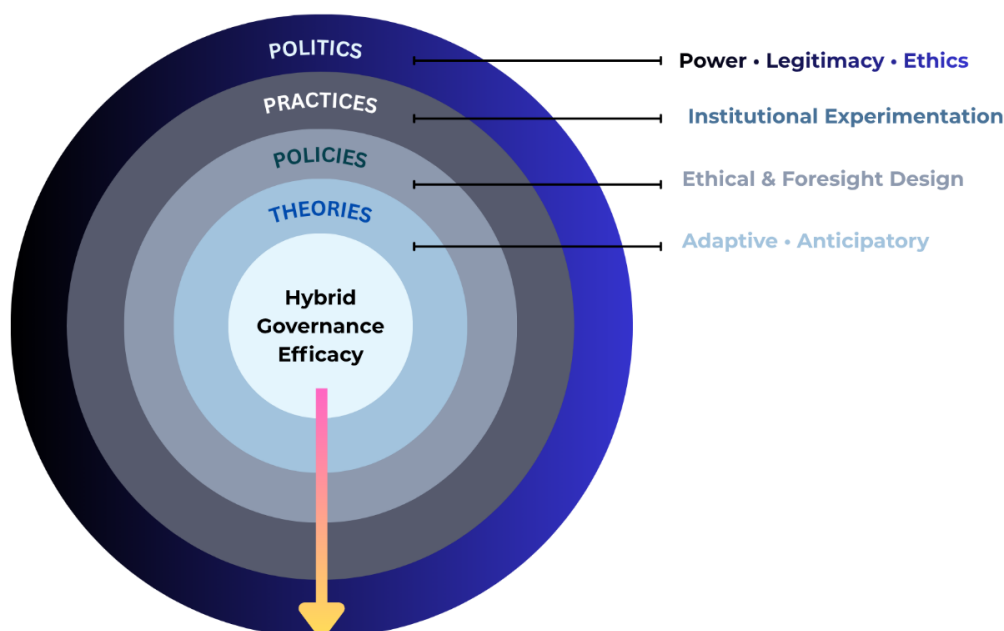


Figure 2. The TP³ Framework: Theories–Policies–Practices–Politics in Hybrid Governance Efficacy

5. Comparative Illustrations and Sectoral Insights

The integration of artificial intelligence (AI), strategic foresight, and digital nudging into governance is no longer an abstract proposition; it is increasingly evident across sectors and regions. This section summarizes how these mechanisms materialize in the public, private, and cross-sectoral domains, reshaping governance efficacy, adaptive capacity, and smart growth trajectories. Drawing on global illustrations, it also reflects on key challenges and structural variations between OECD and emerging economies.

5.1 Public Sector Governance: Toward Intelligent and Anticipatory States

Governments worldwide are transitioning from reactive administration toward anticipatory governance through AI, foresight, and behavioral insights. The emergence of the “intelligent state” reflects efforts to couple real-time analytics with ethical, long-term thinking.

AI applications in the public sector span from predictive policing and fraud detection to healthcare optimization and energy efficiency. These tools enhance responsiveness but require safeguards such as explainability and inclusive data governance. As of 2023, only 15% of governments had adopted formal AI investment frameworks, indicating a maturity gap in AI governance readiness [24].

Strategic foresight is increasingly institutionalized. Countries like Finland, Singapore, and the UK have established foresight units and inter-ministerial futures teams, enabling systematic anticipation of risks and trends. Globally, over 60 countries now have national AI strategies, many embedding foresight as a core function [25].

Behavioral science is also gaining traction. Since the UK launched the first governmental “nudge unit” in 2010, more than 300 behavioral insight teams have emerged across 63 countries [26]. These units use digital nudging to influence public behaviors, such as tax compliance and vaccine uptake. Designed transparently, these nudges enhance legitimacy and policy compliance without coercion.

When AI, foresight, and nudging are aligned, governments become more anticipatory and participatory. For instance, the EU’s anticipatory

innovation governance model links foresight and real-time data analytics to policy experiments—an integrated hybrid governance approach.

5.2 Private Sector Governance: Corporate Foresight and Ethical AI as Strategic Assets

The private sector increasingly treats foresight, ethical AI, and behavioral analytics as strategic enablers of innovation, legitimacy, and risk mitigation. Globally, 78% of companies reported using AI by 2024, up from 55% the year before [27]. About 90% of large firms engage in strategic foresight, and a third have dedicated foresight teams [28]. Firms with formal foresight capabilities outperformed peers by 33% in profitability and 200% in growth over time [29].

Corporate foresight translates environmental scanning into long-term strategy. It helps firms anticipate regulation, technology shifts, and consumer trends. When coupled with AI, foresight generates a composite intelligence system—merging predictive analytics with exploratory scenarios.

Ethical AI practices are also expanding. Many companies are establishing AI ethics boards and publishing transparency reports. However, only 23% currently report having written policies on AI ethics [30]. This highlights a governance gap despite rising awareness.

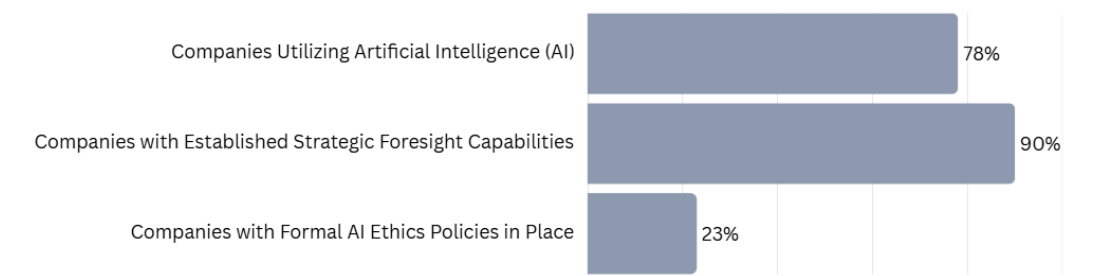


Figure 3. How Companies Integrate Intelligence, Foresight, and Ethics into Governance

Digital nudging aligns customer behavior with corporate and social goals. Platforms use feedback loops and behavioral design to encourage sustainability, savings, and healthy choices. When governed by ethical standards, these nudges promote shared value creation between firms and users.

The convergence of these practices redefines corporate governance. Private firms are becoming hybrid governors—acting as quasi-public institutions with responsibilities extending beyond profit. In doing so, they contribute to a broader governance ecosystem where legitimacy stems from foresight, ethics, and adaptability.

5.3 Hybrid Interfaces: Public–Private Partnerships and Cross-Sectoral Ecosystems

Hybrid governance efficacy is most visible in collaborative platforms such as public–private partnerships (PPPs), data collaboratives, and open innovation labs. These spaces bridge institutional boundaries to create shared value and adaptive learning systems.

Data collaboratives exemplify this model. Governments, tech companies, and academic institutions share datasets to address urban mobility, environmental challenges, or health crises. By 2018, at least 145 such initiatives existed globally [31]. AI is used to process joint data, foresight shapes strategic responses, and nudging tools engage users via apps or dashboards. For these collaboratives to succeed, governance frameworks must address equity, transparency, and data sovereignty.

Living labs also represent hybrid experimentation. The European Network of Living Labs (ENoLL) has over 170 members across 40+ countries [32]. These labs bring together citizens, policymakers, and innovators to co-design and test solutions for smart cities, energy, or healthcare. AI and foresight are deployed not just for technical analysis but as social technologies that facilitate dialogue and experimentation.

Hybrid platforms reveal that governance efficacy is not a fixed institutional trait but a relational outcome. Sustaining them requires inclusive participation, stable funding, and trust between sectors. Without these supports, partnerships risk fragmentation or domination by stronger actors.

5.4 Comparative Discussion

OECD countries generally lead in formalizing hybrid governance due to mature infrastructure, institutional trust, and policy foresight capabilities. Finland, Canada, and South Korea exemplify integrated foresight and AI systems. South Korea, in particular, is ranked among the top countries for government AI readiness [33].

Emerging economies face constraints but also show potential for digital leapfrogging. In Southeast Asia, Sub-Saharan Africa, and Latin America, digital tools are used for real-time governance (e.g. mobile health surveillance or agricultural support). Yet fewer than half of these regions’ countries had a formal AI strategy by 2023.

Infrastructure remains a hurdle: Africa’s internet penetration was only 39% in 2023 compared to 87% in Europe [34]. These disparities limit the scalability of hybrid governance. Still, with low-cost tools and regionally governed data protocols, emerging economies can build resilient and locally relevant models.

Cultural and political contexts also shape implementation. High-trust societies are more receptive to digital nudging and foresight-driven policy. In low-trust environments, such tools may be viewed as technocratic or intrusive. Public attitudes vary significantly: 83% of Chinese and 77% of Indonesians see AI as beneficial, compared to only 40% in Canada and 39% in the U.S. [35]. These perceptions affect both the political viability and ethical reception of hybrid governance innovations.

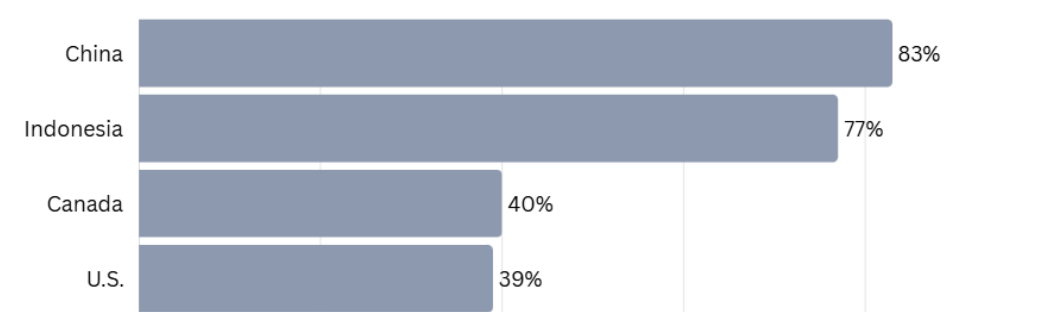


Figure 4. Public Trust in AI by Country (% of people who view AI as beneficial)

Regardless of context, governance efficacy relies on three structural enablers: institutional openness to experimentation, ethical oversight, and cross-sector collaboration. Where these align, hybrid systems demonstrate greater resilience and legitimacy.

5.5 Synthesis: From Sectoral Practices to Systemic Learning

Across all domains, governance efficacy today is best understood as a distributed learning capability. The interplay of AI, foresight, and nudging produces shared intelligence across sectors. Governments, businesses, and

civil society actors are increasingly interlinked in policy cycles that involve sensing (data), anticipating (foresight), and steering (nudging).

This architecture signals a shift in governance logic—from control to co-creation, from regulation to adaptive stewardship. Accountability becomes co-responsibility. Innovation becomes a shared process. And regulation evolves into iterative guidance based on feedback and ethics.

The convergence of practices across sectors leads to system-wide learning. Public experiments inform private practices and vice versa, while hybrid institutions act as accelerators for innovation diffusion. In this way, hybrid governance efficacy underpins smart growth not just through tools, but through learning infrastructures.

Recognizing governance efficacy as a hybrid good reframes it as a co-produced, dynamic capacity that supports resilience and inclusion [39]. It enables societies to respond to complexity not with static control, but with collaborative intelligence and ethical foresight.

6. Discussion: Governance Efficacy as Enabler of Smart Growth

The concept of governance efficacy, when reframed through the lens of hybridization and digital transformation, offers a fertile foundation for understanding how societies can navigate complexity, uncertainty, and rapid technological change. This discussion section synthesizes the theoretical and comparative insights developed earlier to highlight governance efficacy as a central enabler of smart growth—a paradigm of development that integrates innovation, inclusivity, and sustainability. By linking the triadic enablers of artificial intelligence (AI), strategic foresight, and digital nudging with the multi-layered TP³ (Theories–Policies–Practices–Politics) framework, the discussion elucidates how hybrid governance systems produce new forms of adaptive intelligence, ethical legitimacy, and cross-sectoral resilience.

6.1 Smart Growth as a Hybrid Governance Outcome

Smart growth has evolved from its origins in urban and environmental policy to represent a broader strategic vision for sustainable socio-economic development. It seeks to balance economic competitiveness with social inclusion and ecological responsibility. However, realizing this vision depends less on technological innovation per se and more on the

governance architectures that direct, regulate, and legitimize such innovation. Hybrid governance efficacy provides the connective tissue through which smart growth becomes operational [36].

In this context, smart growth is not a sectoral policy but an emergent property of intelligent, anticipatory, and participatory governance [37]. The integration of AI, foresight, and nudging enables institutions to align technological capabilities with public value. AI contributes to smart growth by improving resource efficiency, optimizing infrastructure, and facilitating evidence-based decision-making. Foresight ensures that short-term innovation is situated within long-term sustainability trajectories, anticipating potential risks and societal implications. Digital nudging, finally, fosters behavioral alignment with smart growth objectives—encouraging citizens, consumers, and organizations to participate in collective transitions toward more sustainable futures [38].

These elements reinforce one another in cyclical processes of feedback and learning. Data-driven insights from AI inform foresight exercises, foresight shapes policy design, and nudging operationalizes those policies through behavioral adaptation. When this cycle is institutionalized, smart growth becomes not merely a policy goal but a mode of governance characterized by reflexivity, inclusiveness, and ethical accountability.

6.2 Adaptive and Anticipatory Governance as Strategic Capacity

The discussion of hybrid governance efficacy reveals that adaptability and anticipation constitute the two core strategic capacities required for governance in the digital age. Adaptability refers to the system's ability to adjust to environmental change, technological disruption, and shifting stakeholder expectations. Anticipation denotes the capacity to foresee possible futures and prepare accordingly. Together, they form the basis of governance intelligence—a collective capability distributed across human, institutional, and technological networks [39].

AI enhances adaptability by providing real-time data analytics and pattern recognition that allow decision-makers to respond quickly to changing conditions. Strategic foresight complements this adaptiveness with a temporal and qualitative dimension, broadening the scope of decision-making beyond immediate efficiency concerns to include long-term resilience and equity. Digital nudging acts as the connective mechanism

between anticipation and adaptation: it translates strategic foresight into behavioral change and collective action [40]. Through these interactions, governance efficacy becomes an emergent quality that transcends organizational boundaries.

From a systemic perspective, adaptive and anticipatory governance redefines public administration from a command-and-control model to one of continuous learning. This transformation reflects a shift from rule-based compliance toward data-informed, participatory, and value-sensitive governance. Smart growth thus depends on institutionalizing these learning loops across public, private, and hybrid domains, ensuring that technological and human intelligence co-evolve rather than compete [41].

6.3 Ethical and Behavioral Dimensions of Governance Efficacy

A crucial insight emerging from this analysis is that the efficacy of governance is inseparable from its ethical legitimacy. In hybrid governance systems, where decision-making power is distributed among multiple actors and mediated by technology, the ethical dimension of governance becomes central to sustaining trust and accountability [42]. The capacity to act effectively is constrained and defined by the capacity to act responsibly.

Ethical AI principles—such as transparency, fairness, and accountability—are therefore not peripheral considerations but core determinants of governance efficacy. They ensure that algorithmic processes enhance rather than undermine social equity and democratic legitimacy. Strategic foresight similarly embodies an ethical commitment to intergenerational responsibility: it situates present decisions within the context of their future consequences [43]. Digital nudging, when implemented transparently and participatively, reinforces these ethical commitments by aligning individual behaviors with collective welfare goals.

However, these same technologies can also produce ethical dilemmas. AI systems risk embedding biases, foresight exercises can privilege certain narratives over others, and nudging can be misused to manipulate rather than empower. Governance efficacy, understood as a hybrid good, therefore requires robust ethical infrastructures: mechanisms of accountability, public deliberation, and reflexive evaluation that ensure technologies serve public interest. Ethical governance is not an external constraint on efficiency but a condition for its sustainability.

In this sense, smart growth requires ethical adaptability: the institutional ability to integrate evolving moral norms into governance practice [44]. As technologies advance and social expectations shift, governance systems must continuously revisit their ethical frameworks. This dynamic ethics reflects the hybrid nature of governance efficacy—simultaneously normative and functional, moral and operational.

6.4 Institutional Learning and the Role of Foresight in Systemic Resilience

One of the defining characteristics of hybrid governance efficacy is its orientation toward learning and resilience. Institutions that integrate AI and foresight into their decision processes gain not only efficiency but also the ability to learn from feedback and anticipate systemic shifts. Foresight in particular acts as a cognitive infrastructure for collective learning. By facilitating dialogue across disciplines, sectors, and generations, foresight embeds reflexivity into governance [45].

Institutional learning is not limited to technical adaptation; it involves rethinking fundamental assumptions about value creation, risk, and legitimacy. In public administration, foresight-driven learning supports policy innovation through experimental governance approaches such as policy prototyping and sandboxing. In corporate contexts, it fosters strategic agility and stakeholder engagement. Across both domains, foresight strengthens the feedback link between knowledge and action—transforming governance from a reactive process into an ongoing negotiation between present challenges and future aspirations.

Resilience, as a governance outcome, depends on the capacity to maintain functionality and legitimacy under stress [46]. Hybrid governance systems that combine AI’s analytical precision, foresight’s anticipatory vision, and nudging’s behavioral adaptability are better equipped to absorb shocks and recover. During crises—such as pandemics, climate emergencies, or economic disruptions—these capacities enable faster, evidence-based, and ethically grounded responses. Thus, governance efficacy serves as a resilience multiplier, anchoring smart growth in adaptability and foresight.

6.5 Cross-Sectoral Integration and the Co-Production of Public Value

The hybridization of governance transforms the production of public value into a collective enterprise shared among governments, firms, and civil society. In this model, public value is no longer created solely through state action but through networked interactions that blend public objectives with private innovation. AI systems developed by private companies can serve public monitoring purposes; foresight collaborations between governments and universities can inform strategic planning; behavioral design projects led by NGOs can complement public policy implementation [47].

This co-production of value redefines both the means and the ends of governance efficacy. Efficiency and legitimacy become mutually reinforcing when technological innovation is aligned with ethical and participatory principles [48]. Hybrid governance thus acts as a platform for value orchestration, coordinating diverse actors toward shared goals while preserving pluralism and accountability. The governance system's efficacy depends on its ability to align incentives and norms across these heterogeneous actors—a challenge that requires not only institutional innovation but also cultural transformation.

In practical terms, cross-sectoral integration manifests in collaborative mechanisms such as data partnerships, foresight networks, and behavioral insight alliances. These mechanisms institutionalize communication between actors who traditionally operate in separate spheres [49]. The resulting governance architectures are fluid and adaptive, enabling smart growth that is context-sensitive and continuously updated through feedback. Co-production, therefore, becomes both a method and a measure of governance efficacy.

6.6 The Double Logic of Hybrid Governance: Efficiency and Legitimacy

A recurring theme throughout this analysis is the dual nature of hybrid governance efficacy, which simultaneously pursues efficiency and legitimacy. The efficiency dimension derives from the private-sector logic of innovation, optimization, and performance measurement. The legitimacy dimension stems from the public-sector logic of accountability, inclusion, and justice. Hybrid governance succeeds when it harmonizes

these logics through mutually reinforcing feedback loops rather than allowing them to operate in tension.

AI-driven decision-making embodies the efficiency logic, while foresight and participatory processes reinforce legitimacy. Digital nudging, situated between these domains, translates efficiency into participation by aligning individual behaviors with collective values. When these logics are imbalanced—such as when efficiency dominates without ethical or participatory oversight—governance efficacy declines. Conversely, excessive proceduralism without technological adaptability can result in stagnation. The essence of hybrid governance lies in maintaining a dynamic equilibrium between these two imperatives, ensuring that innovation remains legitimate and legitimacy remains innovative [52].

This dual logic also reflects the broader evolution of governance from hierarchical control to networked coordination. In hybrid governance, authority is distributed and legitimacy is co-produced. Smart growth thus requires not centralized command but orchestrated collaboration—a governance style that enables flexibility without sacrificing accountability.

6.7 Implications for Theory, Policy, and Institutional Design

The synthesis of hybrid governance efficacy and smart growth carries significant implications across theoretical, policy, and institutional domains.

From a theoretical standpoint, it calls for an expansion of governance theory to integrate digital and anticipatory dimensions. Future research should explore how hybrid governance systems generate and distribute knowledge, how they balance human judgment with algorithmic intelligence, and how ethical foresight can be institutionalized. The concept of governance efficacy as a hybrid good provides a new analytical category bridging public administration, innovation studies, and digital ethics.

At the policy level, governments and organizations must move beyond fragmented digital strategies toward integrated AI–foresight–behavioral frameworks. This implies creating institutional capacities that link data analytics with strategic foresight units and behavioral insight teams. Policies should also prioritize ethical design, cross-sectoral collaboration, and public engagement to sustain legitimacy [53].

For institutional design, the challenge is to embed hybrid governance principles into organizational structures and cultures. This involves developing interdisciplinary teams, participatory foresight mechanisms, and digital ethics protocols. Institutions that adopt these principles will be better equipped to navigate uncertainty and contribute to smart growth. Conversely, those that fail to integrate hybrid governance may experience declining trust, rigidity, and diminished policy impact.

6.8 Synthesis: Governance Efficacy as a Catalyst for Sustainable Futures

The discussion underscores that governance efficacy is not a mere indicator of institutional performance but a systemic enabler of transformation. It constitutes the connective mechanism through which societies translate technological potential into public value. By combining intelligence (AI), anticipation (foresight), and behavioral alignment (nudging), hybrid governance architectures generate collective intelligence capable of addressing 21st-century challenges.

In essence, governance efficacy represents the ethical and adaptive capacity of institutions to steer complex systems toward sustainability. It is through this lens that smart growth becomes attainable—not as a linear trajectory of progress, but as a dynamic process of co-evolution between technology, society, and governance. The hybrid good of governance efficacy thus stands as both a theoretical construct and a practical imperative: it is the foundation upon which equitable, anticipatory, and resilient futures can be built.

7. Conclusions and Future Directions

This paper has advanced a conceptual reframing of governance efficacy as a hybrid public–private good, shaped and enabled by the convergence of artificial intelligence (AI), strategic foresight, and digital nudging. In doing so, it has aimed to move beyond linear or sector-specific accounts of digital transformation to offer a systems-oriented view of governance as a distributed, adaptive, and co-produced capacity. Through theoretical synthesis, conceptual modeling, and comparative illustrations, the paper demonstrates that governance efficacy in the digital era is not reducible to institutional efficiency or procedural compliance—it is a dynamic

capability embedded in sociotechnical ecosystems that co-evolve with the tools, values, and behaviors they shape.

At the heart of this argument lies a recognition that the 21st century demands governance architectures that are simultaneously intelligent, anticipatory, and participatory. AI contributes by enabling real-time analysis, decision optimization, and systemic insight. Foresight brings in temporal depth, resilience thinking, and strategic visioning. Digital nudging operationalizes intent by shaping behavior in alignment with public and organizational goals. When these three enablers are integrated within ethically grounded institutional frameworks, governance becomes more than administration—it becomes a learning and sense-making system capable of navigating complexity and catalyzing smart, inclusive growth.

The TP³ framework—Theories, Policies, Practices, and Politics—offered a multi-layered lens for tracing how hybrid governance efficacy is theorized, designed, enacted, and contested. Empirical illustrations from OECD and emerging economies revealed diverse but converging paths toward hybrid governance. From anticipatory innovation models in the European Union to data collaboratives in African cities, the synthesis showed that governance efficacy is no longer confined to the realm of public administration. It is a hybrid function, jointly produced by state institutions, private firms, civil society, and digital infrastructures.

Theoretical Implications. Conceptually, this paper contributes to the literature on adaptive governance, public innovation, and anticipatory policy by developing an integrated framework that positions governance efficacy as a triadic construct—emerging at the intersection of AI, foresight, and behavioral design. It also expands the notion of the “hybrid good” from economic goods to institutional capacities, offering a new analytical category that captures the co-dependent nature of legitimacy, efficiency, and innovation in contemporary governance.

Policy Implications. For policy and institutional design, the analysis underscores the importance of coherence between technological deployment and ethical oversight. The integration of foresight and behavioral insights into AI governance is not a luxury—it is a prerequisite for ensuring that innovation aligns with societal values. Governments should invest in foresight units, AI ethics boards, and behavioral insight

teams as standard components of public governance. Similarly, private organizations must move beyond risk mitigation toward responsible innovation strategies that treat ethical AI and stakeholder foresight as core governance functions.

Institutional Practice. In operational terms, hybrid governance efficacy requires new forms of collaboration across sectors and disciplines. Public–private foresight platforms, living labs, and data collaboratives should be institutionalized as permanent governance infrastructures, not ad hoc initiatives. Cross-sectoral training, interdisciplinary governance education, and open standards for digital ethics are essential to building shared capacities. Organizations that invest in such hybrid capability development will be better positioned to govern responsibly amid ongoing disruption.

Future Research Directions. Several promising research pathways emerge from this analysis. First, empirical validation of the conceptual propositions developed herein—particularly the triadic model of AI, foresight, and nudging—can benefit from comparative case studies and longitudinal analyses. How do different integration pathways affect resilience, legitimacy, and innovation outcomes? Second, metrics and indicators for hybrid governance efficacy must be developed to support benchmarking and evaluation. Existing indices often isolate variables like transparency or digital readiness but do not capture the emergent synergies between strategic foresight, digital behavior, and algorithmic governance. Third, future work should explore the cultural and institutional conditions under which hybrid governance flourishes or falters, with particular attention to trust, accountability, and adaptive learning in low-resource or high-volatility environments.

Finally, as societies grapple with global crises—from climate change to AI-induced economic shifts—the need for governance that is anticipatory, inclusive, and ethically robust becomes ever more pressing. The concept of governance efficacy as a hybrid good provides a normative and analytical compass for navigating this transformation. It invites us to see governance not only as a set of formal institutions but as a collective intelligence system—one that must be continuously cultivated, reflexively governed, and equitably distributed.

By anchoring governance in the triad of technological capability, ethical foresight, and behavioral engagement, societies can move toward smarter, fairer, and more sustainable futures. The challenge is no longer whether hybrid governance efficacy will emerge—it is how intentionally, inclusively, and ethically it will be designed.

References

- [1] E. F. Woodhouse, P. Belardinelli και A. M. Bertelli, «Hybrid Governance and the Attribution of Political Responsibility: Experimental Evidence from the United States,» *Journal of Public Administration Research and Theory*, Volume 32, Issue 1, Pages 150–165, <https://doi.org/10.1093/jopart/muab014>, 2022.
- [2] WBG, «Understanding Hybrid Public-Private Partnerships: A Model for Delivering Infrastructure,» *World Bank Group*, <https://www.worldbank.org/en/topic/sustainableinfrastructurefinance/brief/understanding-hybrid-public-private-partnerships-a-model-for-delivering-infrastructure?>, 2024.
- [3] D. W. Ball, «A Framework for the Private Governance of Frontier Artificial Intelligence,» *arXiv:2504.11501*, <https://doi.org/10.48550/arXiv.2504.11501>, 2025 .
- [4] S. Moqaddamerad και M. Ali, «Strategic foresight and business model innovation: The sequential mediating role of sensemaking and learning,» *Technological Forecasting and Social Change*, Volume 200, <https://doi.org/10.1016/j.techfore.2023.123095>., 2024.
- [5] N. Yusuf, J. Mueller-Kaler και J. Lozano-Jaramillo, «Governing AI for the Future of Humanity,» *The Henry L. Stimson Center*, <https://www.stimson.org/2025/governing-ai-for-the-future-of-humanity/?utm>, 2025.
- [6] I. Andrés, M. Fuentes και D. Lawler, «Artificial intelligence, complexity, and systemic resilience in global governance,» *Frontiers in Artificial Intelligence*, DOI=10.3389/frai.2025.1562095, 2025.
- [7] P. Carvalho, «How Generative AI Will Transform Strategic Foresight,» *Insight & Foresight*, <https://www.ifforesight.com/post/how-generative-ai-will-transform-strategic-foresight>, 2024.
- [8] E. Fitkov-Norris και N. Kocheva, « Leveraging AI for strategic foresight: unveiling future horizons. In M. M. Crawford, & G. Wright (Eds.), Improving and enhancing scenario planning: futures thinking,» *Edward Elgar Publishing*, (pp. 285-304), 9781035310579, <https://researchinnovation.kingston.ac.uk/en/publications/leveraging-ai-for-strategic-foresight-unveiling-future-horizons-3/>, 2025.

- [9] V. Beermann, «The Three Waves of Digital Nudging The Three Waves of Digital Nudging: Concepts, Mechanisms, and Ethical Implications for Information Systems.,» *Conference: America Conference on Information Systems (AMCIS)*,
https://www.researchgate.net/publication/394517287_The_Three_Waves_of_Digital_Nudging_The_Three_Waves_of_Digital_Nudging_Concepts_Mechanisms_and_Ethical_Implications_for_Information_Systems, 2025.
- [10] P. Kilintzis, E. Samara, E. Carayannis και N. Zotas, «Designing Digital Decisions: A Behavioral Approach for SMEs.,» *J Knowl Econ*,
<https://doi.org/10.1007/s13132-025-02845-z>, 2025.
- [11] S. Stieglitz, M. Mirbabaie, A. Deubel, L.-M. Braun και T. Kissmer, «The potential of digital nudging to bridge the gap between environmental attitude and behavior in the usage of smart home applications.,» *International Journal of Information Management*, Volume 72, <https://doi.org/10.1016/j.ijinfomgt.2023.102665>., 2023.
- [12] T. Zsuzsanna, E. Przybilovicz και C. Leleux, «Smart governance in institutional context: An in-depth analysis of Glasgow, Utrecht, and Curitiba.,» *Cities*, Volume 114,
<https://doi.org/10.1016/j.cities.2021.103195>., 2021.
- [13] H. AlMalki και C. Durugbo , «Systematic review of institutional innovation literature: towards a multi-level management model.,» *Manag Rev Q*. 73(2):731–85. doi: 10.1007/s11301-022-00259-8. Epub 2022 Feb 2. PMID: PMC8809248., 2023;73.
- [14] J. Griffith, «Smart Governance for Smart Growth: The Need for Regional Governments.,» *SSRN Electronic Journal*.
10.2139/ssrn.3778141. , 2024.
- [15] L. Lasse , M. Carsten και B. Hansjürgens, «Challenges in ecosystem services governance: Multi-levels, multi-actors, multi-rationalities.,» *Ecosystem Services*. 16. 10.1016/j.ecoser.2015.11.002. , 2015.
- [16] C. Medina-García, S. Nagarajan, L. Castillo-Vysokolan, E. Béatse και P. Van den Broeck, «Innovative Multi-Actor Collaborations as Collective Actors and Institutionalized Spaces. The Case of Food Governance Transformation in Leuven (Belgium)Frontiers in

Sustainable Food Systems,» *Frontiers in Sustainable Food Systems*, DOI=10.3389/fsufs.2021.788934, 2021.

- [17] J. Ramos, «Anticipatory governance: Traditions and trajectories for strategic design.,» *Journal of Futures Studies*. 19. 35-52.
https://www.researchgate.net/publication/288381021_Anticipatory_governance_Traditions_and_trajectories_for_strategic_design, Jose.
- [18] R. Brunner, « Adaptive governance as a reform strategy.,» *Policy Sciences*. 43. 301-341. 10.1007/s11077-010-9117-z. , 2010.
- [19] E. G. Carayannis, R. Dumitrescu, T. Falkowski, G. Papamichail και N. -. R. Zota, «Enhancing SME resilience through artificial intelligence and strategic foresight: A framework for sustainable competitiveness.,» *Technology in Society, Volume 81*,
<https://doi.org/10.1016/j.techsoc.2025.102835>., 2025.
- [20] K. de Fine Licht, «Resolving value conflicts in public AI governance: A procedural justice framework.,» *Government Information Quarterly*, Volume 42, Issue 2, <https://doi.org/10.1016/j.giq.2025.102033>., 2025.
- [21] K. Sandvik, «Calibrating AI/d talk: framing perceptions, reframing policy, and deframing knowledge.,» *Int J Humanitarian Action* 10, 11 .
<https://doi.org/10.1186/s41018-025-00173-0>, 2025.
- [22] L. Rutting, J. Vervoort, H. Mees και P. Driessen, «Strengthening foresight for governance of social-ecological systems: An interdisciplinary perspective.,» *Futures*, Volume 141,
<https://doi.org/10.1016/j.futures.2022.102988>., 2022.
- [23] S. Urueña, H. Rodríguez και I. Andoni, «Foresight and responsible innovation: Openness and closure in anticipatory heuristics.,» *Futures*, Volume 134, <https://doi.org/10.1016/j.futures.2021.102852>., 2021,.
- [24] E. B., «Moving beyond the obsession with nudging individual behaviour: Towards a broader understanding of Behavioural Public Policy.,» *Public Policy and Administration*, 35(3), 337-360.
<https://doi.org/10.1177/0952076719889090>, 2019.
- [25] M. Whitehead, R. Jones, R. Howell, R. Lilley και J. Pykett, «Nudging all over the World: Assessing the Global Impact of the Behavioural Sciences on Public Policy.,» [httpsESRC, ://www.researchgate.net/publication/271826328_Nudging_all_over_th](https://www.researchgate.net/publication/271826328_Nudging_all_over_th)

e_World_Assessing_the_Global_Impact_of_the_Behavioural_Sciences_on_Public_Policy, 2014.

- [26] E. Carayannis, G. Papamichail, Z. N. και D. Askounis, «Corporate Foresight: Navigating Uncertainty in a VUCA World.,» *J Knowl Econ*, <https://doi.org/10.1007/s13132-024-02587-4>, 2025.
- [27] OECD, «Governing with Artificial Intelligence: The State of Play and Way Forward in Core Government Functions,» *OECD Publishing, Paris*, <https://doi.org/10.1787/795de142-en.>, 2025.
- [28] AIIA, «20 Nationals AI Strategies - The 2020 AI Strategy Landscape,» *International Artificial Intelligence Industry Alliance*, <https://www.aiia-ai.org/col.jsp?id=200#:~:text=Many%20countries%20have%20launched%20their,release%20its%20document%20in%202017>, 2023.
- [29] C. Hubble και C. Varazzani, «Mapping the global behavioural insights community,» *OPSI*, <https://oecd-opsi.org/blog/mapping-behavioural-insights/#:~:text=the%20world,information%20about%20government%20BI%20functions>, 2023.
- [30] HAI, «The 2025 AI Index Report,» *Stanford Institute for Human-Centered AI (HAI)* , 2025 <https://hai.stanford.edu/ai-index/2025-ai-index-report>.
- [31] S. Bressan, «Foresight Myths, Debunked: Leveraging Futures Studies for German Security Policy,» *Global Public Policy Institute (GPPi)*, <https://gppi.net/2025/05/21/foresight-myths-debunked#:~:text=Futures%20studies%20is%20much%20more,temperatures%20a%C2%A0helicopter%20on%20NATO%E2%80%99s%20southern>, 2025.
- [32] T. Devesa, S. Fisher, J. Kilian, M. Ochi, D. Peterson, R. Razdan, J. Seong, O. Tonby και N. Yamakawa, «Imagining your customers' possible futures: A Design x Foresight approach,» *McKinsey Global Institute*, <https://www.mckinsey.com/featured-insights/future-of-asia/imagining-your-customers-possible-futures-a-design-x-foresight-approach>, 2021.
- [33] S. Mintz, «Ethical AI is Built On Transparency, Accountability and Trust,» *Corporate Compliance Insights*, <https://www.corporatecomplianceinsights.com/ethical-use-artificial->

intelligence/#:~:text=,their%20companies%20should%20have%20one, 2020.

- [34] M. Winowatan, «The Emergence of Data Collaboratives...in Numbers,» *The Govlab*, <https://blog.thegovlab.org/the-emergence-of-data-collaboratives-in-numbers>, 2018.
- [35] ENoLL , «Global Community of Changemakers,» *European Network of Living Labs*, <https://enoll.org/#:~:text=Founded%20in%202006%20and%20headq,uartered,centred%20practices>, 2025.
- [36] O. Insights, «Government AI Readiness Index 2024,» *Oxford Insights*, <https://oxfordinsights.com/ai-readiness/ai-readiness-index/#:~:text=The%20US%20leads%20in%20AI,on%20the%20Tech,nology%20Sector%20Pillar>, 2024.
- [37] S. Ekanem, «African countries with the largest internet population in 2025,» *Business Insider Africa*, <https://africa.businessinsider.com/local/lifestyle/african-countries-with-the-largest-internet-population-in-2025/871gpnf#:~:text=However%2C%20Africa%20still%20lags%20behind,in%20Europe>, 2025 .
- [38] HAI, «The 2025 AI Index Report,» *Stanford Institute for Human-Centered AI (HAI)*, <https://hai.stanford.edu/ai-index/2025-ai-index-report>, 2025.
- [39] E. G. Carayannis, R. Dumitrescu, T. Falkowski και N. -R. Zota, «Empowering SMEs “Harnessing the Potential of Gen AI for Resilience and Competitiveness,» *IEEE Transactions on Engineering Management*, vol. 71, pp. 14754-14774 doi: 10.1109/TEM.2024.3456820., 2024.
- [40] A. Almulhim και T. Yigitcanlar, «Understanding Smart Governance of Sustainable Cities: A Review and Multidimensional Framework.,» *Smart Cities*, 8, 113. <https://doi.org/10.3390/smartcities8040113>, 2025.
- [41] Z. Tomor, A. Meijer, A. Michels και S. & Geertman, « Smart Governance For Sustainable Cities: Findings from a Systematic Literature Review.,» *Journal of Urban Technology*, 26(4), 3–27. <https://doi.org/10.1080/10630732.2019.1651178>, 2019.

- [42] R. Wang, H. Qiu, R. Liu, H. Huo, X. Cheng και X. Liu, «A hybrid governance framework for adaptive and sustainable urban energy management.,» *Sustainable Cities and Society, Volume 130*, <https://doi.org/10.1016/j.scs.2025.106638>, 2025.
- [43] OECD, «Building Anticipatory Capacity with Strategic Foresight in Government: Lessons from Lithuania, Italy, and Malta.,» *OECD Public Governance Reviews, OECD Publishing, Paris*, <https://doi.org/10.1787/d7eb0bb6-en>, 2025.
- [44] J. Hood , « Adaptive Governance: Thriving in a Dynamic Public Sector Landscape.,» *Journal of Research in International Business and Management (2024) Volume 11, Issue 1, DOI: 10.14303/jribm.2024.004*, 2024.
- [45] D. Ahern, «The New Anticipatory Governance Culture for Innovation: Regulatory Foresight, Regulatory Experimentation and Regulatory Learning.,» *Eur Bus Org Law Rev* 26, 241–283 . <https://doi.org/10.1007/s40804-025-00348-7>, 2025.
- [46] A. I. Zahari, J. Said, N. Muhamad και S. Mohd Ramly, «Ethical culture and leadership for sustainability and governance in public sector organisations within the ESG framework.,» *Journal of Open Innovation: Technology, Market, and Complexity, Volume 10, Issue 1*, <https://doi.org/10.1016/j.joitmc.2024.100219>, 2024.
- [47] A. Gofen, A. Moseley, E. Thomann και R. & Kent Weaver, «Behavioural governance in the policy process: introduction to the special issue.,» *Journal of European Public Policy*, 28(5), 633–657. <https://doi.org/10.1080/13501763.2021.1912153>, 2021.
- [48] Z. Khamzina , Y. Buribayev και Y. Tileubergenov , «Institutionalizing integrity: rethinking ethical and cultural standards in Kazakhstan's civil service.,» *Front. Polit. Sci.* 7:1573608. doi: [10.3389/fpos.2025.1573608](https://doi.org/10.3389/fpos.2025.1573608), 2025.
- [49] D. Fasnacht και J. Schlosser, «The role of foresight in bridging the gap between trends and customer experiences.,» *European Journal of Futures Research* 13, 11. <https://doi.org/10.1186/s40309-025-00256-6>, 2025.

- [50] L. Zumbrunn, «Resilience through Foresight: Implications for the Public Sector,,» *Swiss Yearbook of Administrative Sciences*, 14(1), p. 45–57. <https://ssas-yearbook.com/articles/10.5334/ssas.183>, 2023.
- [51] Á. Nagy και J. Gáspár, «Responsible organizational transformation: Social and systemic challenges, and the role of foresight,,» *Sustainable Futures*, Volume 10, <https://doi.org/10.1016/j.sftr.2025.101325>., 2025.
- [52] S. Page, M. Stone, J. Bryson και B. Crosby, «Public value creation by cross-sector collaborations: A framework and challenges of assessment,,» *Public Administration*. 93. 10.1111/padm.12161. , 2015.
- [53] K. Nordberg και I. N. Aflaki, «Public sector readiness for value co-creation: the diffusion of a governance innovation,,» *Public Money & Management*, 45(5), 435–446. <https://doi.org/10.1080/09540962.2024.2397050>, 2024.
- [54] E. Samara, P. Kilintzis, E. Carayannis και N. Zotas, «How Startups Can Decode Shifting Consumer Preferences in the Digital Era: Leveraging Behavioral Insights for Agile Business Model Innovation,,» *J Knowl Econ*. <https://doi.org/10.1007/s13132-025-02764-z>, 2025.
- [55] M. Androutsopoulou, E. Carayannis, D. Askounis και N. Zotas, «Towards AI-Enabled Cyber-Physical Infrastructures—Challenges, Opportunities, and Implications for a Data-Driven eGovernment Theory, Policy, and Practice,,» *J Knowl Econ* . <https://doi.org/10.1007/s13132-025-02726-5>, 2025.