Perspective

Complexity, Ingenuity and the Knowledge Architecture of Modernity: Interdisciplinarity as Institutional Response

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Abstract

The commentary argues that modernity is characterised by structural complexity and 'wicked problems' that expose a persistent mismatch between systemic challenges and fragmented knowledge architectures. It proposes 'ingenuity', or the production of actionable ideas, as a productive force, and positions think tanks and interdisciplinary platforms as institutional spaces that translate knowledge into adaptive, policy-relevant pathways. The article identifies core lacunae within university systems, including disciplinary silos, citation-centred incentives, and limited engagement with policy practice and grey literature, which constrain the production of actionable ideas. Interdisciplinarity is therefore framed not as a cosmetic aggregation of perspectives but as a problem-driven integrative practice that redefines rigour through methodological plurality, systems thinking and institutional collaboration.

Keywords

Interdisciplinary perspective, wicked problems, complexity, institutions, ingenuity gap

Complexity and 'Wicked Problems'

The defining feature of modernity is structural complexity. Modern-day problems are intricately intertwined, rendering multidimensionality and complexity to the

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challenges societies face today. Climate instability, digital disruption, hydropolitical tensions, public health fragility, volatile geopolitics and the ever-shifting global order, developmental challenges such as poverty, health and education, supply-chain bottlenecks, ecological stresses and cultural shocks, converge to create a unique global equilibrium that can most aptly be described as *polycrisis* (Tooze, 2022). It has now been acknowledged in public policy discourses that the traditional knowledge architectures are not equipped to address the complex problems confronting modern societies.

The distinction between complicated and complex problems is therefore foundational. Complicated problems, while difficult, can be decomposed into constituent simple problems. Simple problems are those that can be expressed in the framework of the ordinate and the abscissa. They admit solutions within linear analytical frameworks and reductionist modelling approaches that have long underpinned scientific inquiry. Eventually, aggregating the constituent solutions of the various constituent simple problems can provide solutions, or multiple point solutions, each of whose suitability can change with time and space. Complex problems, however, resist such decomposition. They arise from interacting variables embedded within adaptive social–ecological–technological–economic–cultural–political systems, producing feedback loops, emergent behaviour and unintended consequences that defy linear prediction.

Modernity has intensified this complexity. Industrialisation, globalisation, digitisation, servicification and financialisation have created unprecedented interdependencies across domains that were historically analysed separately. Climate change exemplifies this shift: it simultaneously engages atmospheric science, geopolitics, development finance, migration, public health and intergenerational ethics. Artificial intelligence similarly reflects duality—generating productivity gains while raising questions of bias, governance, labour displacement and inequality. Agricultural policy demonstrates comparable tensions, where subsidy regimes designed to enhance food security may deepen water stress, distort resource allocation and create ecological trade-offs. These are not technical problems alone; they are 'wicked problems' (Head, 2015) involving competing values, incomplete knowledge and evolving system dynamics.

Institutionalised Reductionism, Disciplinary Fragmentation and Lack of 'Ingenuity'

Yet knowledge institutions continue to operate largely within disciplinary structures designed for a more stable world. Universities remain organised around intellectual compartments, with incentive systems that privilege methodological orthodoxy, disciplinary journals and citation-based measures of merit. Though such structures safeguard rigour, their strict adherence to disciplinary boundaries not only flares reductionist thinking, but progressively discourages integrative inquiry and intellectual risk-taking. The result is a structural mismatch: problems are systemic, while knowledge production remains fragmented. Addressing this mismatch requires rethinking not the value of disciplines but the architecture through which they interact.

This mismatch can be more appropriately delineated as the gap between the production, or supply, of and the demand for 'ingenuity', or actionable ideas to solve complex problems, as defined by Homer-Dixon (1995). In an extension of classical economic thinking, where production is expressed as a function of four factors, namely land, labour, capital and enterprise, 'ingenuity' can well be represented as the fifth factor. This position becomes even more prominent for modern complex societies, where the capacity to generate actionable ideas becomes a productive force in its own right and emerges as the differentiating force, explaining the divergences between the total factor productivities of two economies (Homer-Dixon, 2000).

This concept is particularly powerful when distinguishing between technical and social ingenuity. Technical ingenuity refers to technological innovations, analytical tools and methodological advances that address specific dimensions of problems. Social ingenuity, by contrast, concerns institutional arrangements, governance frameworks, organisational design and behavioural mechanisms that enable collective action. Development outcomes depend not only on technological solutions but on the capacity to align incentives, manage trade-offs and coordinate diverse actors. The gap between the demand for such ideas and their supply—the ingenuity gap—constitutes a fundamental dimension of development disparity.

Extending this argument further, ingenuity may be conceptualised as a form of capital. Inclusive wealth frameworks typically recognise physical, human, social and natural capital (United Nations Environment Programme, 2023). Incorporating ingenuity as a fifth capital highlights the importance of idea generation in shaping adaptive development pathways (Ghosh, 2025a). Many policy failures are not failures of resources but failures of imagination—the inability to produce ideas appropriate to complex challenges. This perspective shifts analytical attention from resource availability to institutional capacity for knowledge production and translation.

The Think Tanks and Interdisciplinarity

The institutional actors best positioned to mediate this translation are think tanks. Situated between universities and consulting firms, think tanks occupy a unique epistemic space. They function as ideational laboratories that translate interdisciplinary insights into policy-relevant pathways. Their contribution lies not only in research generation but in convening cross-sector dialogue, interrogating institutional design, democratising access to data and exploring counterfactual policy scenarios (Ghosh, 2025b). Unlike academic institutions, whose primary audience is scholarly peers, think tanks operate at the interface between knowledge and decision-making. Their role is to curate relevance—converting theoretical insight into actionable frameworks while acknowledging uncertainty and the absence of definitive solutions (Ghosh, 2025b).

This mediating role becomes particularly important in complex policy environments where knowledge is distributed across actors and formats. A significant proportion of actionable insight resides in grey literature—policy briefs, mission

reports, implementation documentation, parliamentary committee findings and field studies. These sources capture real-time learning, institutional memory and practical constraints that rarely appear in peer-reviewed journals. This is the space often neglected and dismissed by academia. Dismissing grey literature as inferior overlooks the lived laboratory of policy. Engaging it critically expands the evidentiary base necessary for systems thinking and strengthens the relevance of academic research.

Meaningful interdisciplinarity must therefore be problem-driven rather than cosmetic. It involves integrating methods rather than merely assembling perspectives. Interdisciplinary research begins with real-world problems, accepts methodological plurality and recognises that technical ingenuity must be complemented by social ingenuity. It interrogates incentive structures, institutional path dependencies, power asymmetries and ethical trade-offs. Importantly, it requires methodological flexibility—allowing research questions to determine methods rather than disciplinary conventions to dictate problem framing. This implies that rigour must be redefined, rather than being seen through the lens of academic journals operating in disciplinary silos, or the compartmentalised academic departments operating in the ivory towers, keeping reality in oblivion. Rigour, therefore, should encompass conceptual clarity, transparent assumptions, empirical grounding, ethical reflexivity and methodological appropriateness rather than methodological perfection and disciplinary purity alone.

Complexity and Policy Failures

A useful illustration of these dynamics can be witnessed with the Farakka Barrage in West Bengal. Constructed with the specific objective of improving navigability in Kolkata Port through sediment flushing, the barrage represented a technically rational engineering intervention. However, its systemic consequences reveal the nature of wicked complexity. Altered sediment flows have affected delta morphology and ecological processes, contributing to land subsidence and coastal vulnerability. The intervention has generated geopolitical tensions between India and Bangladesh, regional disputes over flooding between West Bengal and Bihar, and the shrinkage of the tidally active component of the Ganges delta, which encompasses the Sundarbans archipelago, due to sediment arrest in the upstream of the barrage, while creating new dependencies for water security in the non-tidal part of West Bengal. Removing the barrage would address some concerns while creating others; maintaining it perpetuates trade-offs (Ghosh, 2022). The case demonstrates that complex interventions cannot be evaluated through single-discipline analysis. They require integrated understanding across hydrology, ecology, economics, politics and social systems.

Such examples also explain why policy failures persist despite technically sound solutions. Many failures are not technical failures but failures of integration. Policies falter when governance capacity is weak, incentives are misaligned, social acceptance is ignored, or ethical implications are overlooked. Technical ingenuity without social ingenuity produces fragility. Effective policy design

must incorporate reflexive feedback loops, adaptive learning mechanisms and institutional flexibility capable of responding to evolving conditions (Maxim et al., 2029; Ostrom, 2009). This insight reinforces the argument that knowledge systems must evolve alongside the complexity they seek to address.

The implications for academic publishing are significant. Interdisciplinary journals possess the potential to become knowledge bridges rather than repositories. To realise this potential, they must encourage policy-linked scholarship, systems-based case studies, methodological pluralism and engagement with grey literature. They should facilitate dialogue across academia, policy and society while avoiding hyper-specialised debates detached from real-world relevance. The challenge is therefore institutional rather than editorial. Journals must help reshape the norms through which knowledge is validated and applied.

Why is Academia Failing Societies?

Structural barriers to such transformation remain substantial. Promotion criteria tied to journal rankings, peer review scepticism towards methodological plurality, discipline-segmented funding streams and citation-centric impact metrics constrain interdisciplinary work. As long as intellectual merit is equated primarily with disciplinary publication, integration will remain difficult. Redefining rigour and impact is therefore central to closing the ingenuity gap. Impact must be measured not only through citations but through influence on policy design, institutional reform and societal outcomes.

The broader vision that emerges is one of institutional redesign. Complexity has redefined knowledge needs; knowledge must now redefine its institutions. Universities remain indispensable custodians of rigour, but they cannot operate in isolation. Think tanks, policy platforms and interdisciplinary journals must function as integrative spaces that translate knowledge into adaptive policy pathways. When liberal arts inform science, science informs policy, policy incorporates ethics and knowledge engages society, the production of social ingenuity becomes possible.

This perspective also reframes the role of researchers. Early-career scholars must master disciplinary foundations while cultivating systems thinking. They must engage with practitioners, critically read grey literature and develop ethical reasoning capacities capable of navigating trade-offs inherent in complex problems. Communication across epistemic communities becomes a core skill, as knowledge translation is central to closing the gap between research and action. Interdisciplinary scholarship thus requires both intellectual curiosity and institutional courage.

The Future of Research Ecosystems

Ultimately, the future of research ecosystems will be determined less by impact factors and more by their capacity to generate actionable, adaptive and ethically grounded ideas. Think tanks act as incubators of such ingenuity, interpreting the

maladies of complexity and designing pathways rather than definitive solutions. Interdisciplinary journals face a similar choice: remain archival structures or become bridges connecting knowledge to societal transformation.

The urgency of this choice is evident. If knowledge institutions continue to reward compartmentalisation, dismiss grey literature and privilege citation over relevance, the ingenuity gap will persist. Conversely, institutionalising integrative spaces that value systems thinking, methodological pluralism and policy engagement can strengthen the intellectual infrastructure required for modern governance. In this sense, the question is not whether interdisciplinarity is desirable but whether knowledge systems can adapt quickly enough to the complexity of the problems they confront.

The architecture of knowledge production, therefore, stands at a critical juncture. Embracing complexity requires recognising ingenuity as central to development, redefining rigour and redesigning institutional pathways that connect research with action. If these shifts occur, knowledge ecosystems will not merely respond to modernity's challenges—they will help shape adaptive, resilient and inclusive futures.

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