



## Editorial

**INTERDISCIPLINARY FRONTIERS: BRIDGING KNOWLEDGE FOR CONTEMPORARY CHALLENGES****FRONTEIRAS INTERDISCIPLINARES: UMA PONTE DE CONHECIMENTO PARA OS DESAFIOS CONTEMPORÂNEOS**Rodrigo Franklin Frogeri<sup>1</sup> , Pedro dos Santos Portugal Júnior<sup>2</sup> 

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**Abstract**

Interdisciplinary research has emerged as a fundamental approach to tackling the multifaceted challenges of the modern world. By integrating methods, theories, and perspectives from diverse disciplines, interdisciplinarity transcends the limitations of singular disciplinary frameworks, enabling a more holistic understanding of complex issues. This editorial explores the increasing prominence of interdisciplinary research, evidenced by bibliometric trends that demonstrate a steady rise in cross-disciplinary citations since the 1980s. While such research often experiences delayed recognition, its long-term impact is significant, fostering paradigm shifts and new research trajectories. Despite its potential, interdisciplinary research encounters substantial barriers, including epistemological divides, institutional constraints, and methodological incompatibilities. These challenges are particularly pronounced in addressing "wicked problems"—issues characterized by ambiguity, competing values, and systemic interdependencies, such as climate change, healthcare equity, and sustainable agriculture. The success of interdisciplinary initiatives depends not only on methodological integration but also on reflexivity and epistemic humility, acknowledging the biases inherent in different disciplinary perspectives. This editorial highlights key domains where interdisciplinary collaboration is imperative: healthcare innovations, technological and agricultural advances, and socio-cultural and economic transformations. In these areas, solutions must reconcile scientific, ethical, and socio-political considerations to ensure equitable and sustainable outcomes. Recognizing the need for institutional reforms, scholarly platforms like *Mythos* play a crucial role in legitimizing and fostering interdisciplinary dialogue. By embracing methodological pluralism and collaborative rigor, interdisciplinary research can illuminate pathways toward a more just and sustainable future, addressing the urgent challenges of our time with integrated and adaptive strategies.

**Keywords:** Interdisciplinary Research, Wicked Problems, Methodological Integration, Institutional Constraints, Sustainable Solutions.

## Resumo

A pesquisa interdisciplinar consolidou-se como uma abordagem fundamental para enfrentar os desafios multifacetados do mundo contemporâneo. Ao integrar métodos, teorias e perspectivas de diversas áreas do conhecimento, a interdisciplinaridade transcende as limitações dos quadros disciplinares isolados, possibilitando uma compreensão mais holística de questões complexas. Este editorial examina a crescente proeminência da pesquisa interdisciplinar, evidenciada por tendências bibliométricas que indicam um aumento constante de citações transdisciplinares desde a década de 1980. Embora esse tipo de pesquisa frequentemente receba reconhecimento tardio, seu impacto em longo prazo é significativo, impulsionando mudanças de paradigma e novas trajetórias investigativas. Apesar de seu potencial, a pesquisa interdisciplinar enfrenta obstáculos substanciais, como divisões epistemológicas, restrições institucionais e incompatibilidades metodológicas. Tais desafios são particularmente evidentes no tratamento de "*problemas perversos*" (wicked problems) — questões marcadas por ambiguidade, valores conflitantes e interdependências sistêmicas, como mudanças climáticas, equidade em saúde e agricultura sustentável. O sucesso de iniciativas interdisciplinares depende não apenas da integração metodológica, mas também da reflexividade e da humildade epistêmica, reconhecendo os vieses inerentes às diferentes perspectivas disciplinares. Este editorial destaca domínios-chave nos quais a colaboração interdisciplinar é imprescindível: inovações em saúde, avanços tecnológicos e agrícolas e transformações socioculturais e econômicas. Nesses campos, as soluções devem conciliar considerações científicas, éticas e sociopolíticas para garantir resultados equitativos e sustentáveis. Reconhecendo a necessidade de reformas institucionais, plataformas acadêmicas como a *Mythos* desempenham um papel crucial na legitimação e promoção do diálogo interdisciplinar. Ao adotar o pluralismo metodológico e o rigor colaborativo, a pesquisa interdisciplinar pode iluminar caminhos para um futuro mais justo e sustentável, enfrentando os urgentes desafios de nosso tempo com estratégias integradas e adaptativas.

**Keywords:** Pesquisa Interdisciplinar, Problemas Perversos, Integração Metodológica, Restrições Institucionais, Soluções Sustentáveis.

## 1 INTRODUCTION

Interdisciplinary research has emerged as a critical paradigm in addressing the complex challenges of the modern world, bridging the gaps between traditionally siloed academic disciplines. Defined as the integration of methods, theories, and perspectives from multiple fields, interdisciplinarity seeks to transcend the limitations of singular disciplinary approaches to solve problems that resist simple categorization (Van Noorden, 2015). Over recent decades, its prominence has grown, driven by the recognition that many scientific, social, and environmental issues demand collaborative frameworks to account for interconnected systems and diverse stakeholders.

This shift is reflected in quantitative analyses of scholarly activity: since the mid-1980s, research papers have increasingly cited works outside their own disciplines, signaling a steady rise in cross-disciplinary engagement (Van Noorden, 2015). Yet, despite its celebrated potential, interdisciplinary research faces significant epistemological, institutional, and practical challenges. These challenges are particularly pronounced when addressing “wicked problems” - complex, ill-defined issues characterized by competing values, incomplete knowledge, and irreversible consequences (Rittel & Webber, 1973). By examining the drivers, impacts, and barriers of interdisciplinary work, this introduction synthesizes insights from diverse scholarly perspectives to contextualize its necessity, critique its limitations, and explore pathways for its effective implementation.

The ascendancy of interdisciplinary research is evident in bibliometric trends. An analysis of over 35 million papers in the Web of Science revealed that references to works in other disciplines have risen steadily in both natural and social sciences since the 1980s, while citations within specialized subfields have declined (Van Noorden, 2015). This trend underscores a broader intellectual shift toward integrating disparate knowledge domains.

Notably, interdisciplinary research exhibits a temporal dimension in its impact: while such papers initially receive fewer citations than discipline-focused studies, their influence grows significantly over time. For instance, interdisciplinary works gain 15% more citations than monodisciplinary ones after 13 years, particularly when bridging distant fields like biology and engineering (Van Noorden, 2015). This delayed recognition suggests that interdisciplinary contributions often catalyze paradigm shifts or spawn new research trajectories, even if their immediate novelty challenges established disciplinary norms.

However, the relationship between interdisciplinarity and impact is nonlinear. Studies indicate that moderate interdisciplinarity - combining adjacent fields - yields higher citation rates than extreme cross-disciplinary synthesis, which risks alienating specialized audiences (Van Noorden, 2015). Such findings highlight the delicate balance required to navigate the tension between innovation and coherence in interdisciplinary endeavors.

The impetus for interdisciplinary collaboration is deeply rooted in the nature of contemporary challenges. Rittel and Webber (1973) famously distinguished “wicked problems” from “tame” ones, arguing that societal issues such as poverty, climate change, and urban planning defy definitive formulation or solution. Unlike tame problems, which are well-structured and amenable to linear scientific methods, wicked problems are characterized by ambiguous boundaries, conflicting stakeholder values, and systemic interdependencies.

For example, addressing poverty requires grappling with interconnected factors such as education, health, cultural norms, and economic systems- each of which resists reduction to a single disciplinary lens (Rittel & Webber, 1973). Wicked problems also lack stopping rules; solutions are provisional and contingent, often generating unintended consequences that necessitate iterative

adaptation. This inherent complexity demands approaches that integrate diverse methodologies, from quantitative modeling to qualitative socio-political analysis, while acknowledging the normative dimensions of problem framing.

As Rittel and Webber (1973) caution, treating wicked problems as tame ones - through oversimplified models or technocratic solutions - risks exacerbating societal inequities and entrenching path dependencies.

The practical implementation of interdisciplinary research, however, is fraught with barriers. Léle and Norgaard (2005) identify four major challenges: (1) the embeddedness of values in scientific inquiry, (2) divergent theoretical frameworks across disciplines, (3) epistemological and methodological incompatibilities, and (4) institutional structures that disincentivize collaboration. Within the natural sciences, interdisciplinary collaboration is often hindered by mismatched taxonomies and disciplinary parochialism. For instance, soil scientists and ecologists may categorize phenomena differently, complicating efforts to link soil health to ecosystem outcomes (Léle & Norgaard, 2005).

These divides are amplified when bridging natural and social sciences, where differences in worldviews, methodologies, and societal perceptions of rigor create communication chasms. Natural scientists, trained to seek objective truths, may dismiss qualitative social science approaches as insufficiently rigorous, while social scientists critique natural scientists for oversimplifying human behavior through deterministic models (Léle & Norgaard, 2005). Such tensions are exacerbated by institutional hierarchies that privilege “hard” sciences over interpretive disciplines, reinforcing silos and stifling integrative efforts.

The value-laden nature of scientific inquiry further complicates interdisciplinary work. Even ostensibly neutral concepts, such as “sustainable development” or “ecosystem health,” are shaped by implicit normative judgments about which outcomes matter and for whom. For example, debates over forest management often conflate ecological sustainability with social equity, as different stakeholders prioritize biodiversity conservation, resource extraction, or community livelihoods (Léle & Norgaard, 2005).

Natural scientists may advocate for pristine ecosystems based on ecological metrics, while social scientists emphasize the legitimacy of local resource use practices. These divergent priorities reflect deeper epistemological divides: whereas natural sciences often assume a knowable, measurable reality, social sciences grapple with constructed meanings and contested power dynamics (Léle & Norgaard, 2005). Reconciling these perspectives requires not only methodological flexibility but also reflexivity - acknowledging how disciplinary biases shape problem definitions and solutions.

The challenges of interdisciplinary research are further compounded by institutional and societal structures. Academic reward systems, funding mechanisms, and disciplinary training programs often prioritize specialization over integration. Researchers pursuing interdisciplinary projects face career risks, as their work may lack visibility within traditional journals or tenure committees (Van Noorden, 2015). Moreover, societal perceptions of science influence interdisciplinary dynamics. For instance, economics - often viewed as the most “scientific” social science due to its quantitative rigor - commands greater policy influence than anthropology or sociology, despite the latter’s insights into cultural and institutional contexts (Léle & Norgaard, 2005). This hierarchy perpetuates a cycle where dominant disciplines shape research agendas, marginalizing alternative perspectives essential for addressing wicked problems.

Despite these barriers, interdisciplinary research remains indispensable for navigating the complexities of the 21st century. The growing recognition of its long-term impact, as evidenced by citation trends, underscores its potential to generate transformative knowledge (Van Noorden, 2015).

Success, however, demands institutional reforms—such as interdisciplinary curricula, collaborative funding models, and evaluative frameworks that value integrative scholarship. Equally critical is cultivating a mindset of epistemic humility, where researchers acknowledge the limitations of their disciplinary lenses and engage in genuine dialogue with diverse stakeholders.

As Rittel and Webber (1973) remind us, wicked problems require not definitive solutions but adaptive, participatory processes that embrace plurality and uncertainty. In this light, interdisciplinarity is not merely a methodological approach but an ethical imperative—one that calls for reimagining the boundaries of knowledge to foster inclusive, resilient responses to the interconnected challenges of our time.

### ***Toward an Interdisciplinary Future***

The imperative for interdisciplinary scholarship, as underscored by the complexities of wicked problems and the limitations of siloed inquiry, finds urgent relevance in the domains of Healthcare Innovations: Environment, Access, and Technology; Technological and Agricultural Advances: Efficiency and Sustainability; and Socio-Cultural and Economic Transformations. These areas epitomize the interconnected challenges of our era, demanding integrative frameworks that transcend disciplinary boundaries while embracing ethical, ecological, and equity-oriented imperatives.

In Healthcare Innovations, the interplay of environmental determinants, equitable access, and technological advancements illustrates the necessity of interdisciplinary synthesis. For instance, addressing disparities in healthcare access requires not only biomedical expertise but also socio-economic analyses of systemic barriers and environmental assessments of pollution's health impacts. Telemedicine, while a triumph of technology, must be contextualized within cultural norms and infrastructural realities to avoid exacerbating inequities (Léle & Norgaard, 2005). Similarly, sustainable healthcare systems must reconcile ecological stewardship - such as reducing medical waste - with ethical obligations to marginalized communities. Here, the “wicked” nature of healthcare challenges, as defined by Rittel and Webber (1973), becomes evident: solutions are provisional, value-laden, and contingent on balancing competing priorities.

Technological and Agricultural Advances further underscore the interdependence of efficiency and sustainability. Precision agriculture, powered by AI and IoT, promises to optimize yields while minimizing environmental footprints. Yet, its implementation hinges on integrating ecological knowledge (e.g., soil health dynamics), socio-economic insights (e.g., smallholder farmers' needs), and ethical considerations (e.g., data ownership in agritech). The historical missteps of monoculture farming - initially lauded for efficiency but later critiqued for biodiversity loss and soil degradation - serve as cautionary tales of disciplinary myopia (Van Noorden, 2015). By contrast, interdisciplinary approaches, such as agroecology, blend traditional ecological knowledge with modern science to foster resilience.

In the realm of Socio-Cultural and Economic Transformations, the fusion of cultural narratives, technological disruption, and economic paradigms reveals the inadequacy of singular disciplinary

lenses. The digital economy, for example, reshapes labor markets and cultural identities simultaneously, necessitating analyses that merge economic modeling with anthropological critiques of techno-cultural shifts. Likewise, urbanization - a driver of both economic growth and spatial inequity - demands urban planners to engage with sociologists, climate scientists, and grassroots activists to design cities that are inclusive and climate-resilient. These transformations are inherently “wicked”: they lack definitive solutions and demand iterative, participatory processes (Rittel & Webber, 1973).

The challenges outlined - epistemological divides, institutional inertia, and the valorization of certain disciplines over others—are not insurmountable. Journals like *Mythos* play a pivotal role in dismantling these barriers by legitimizing interdisciplinary scholarship, creating spaces for methodological pluralism, and rewarding collaborative rigor.

By foregrounding themes such as healthcare equity, sustainable agriculture, and socio-cultural justice, *Mythos* can model the reflexivity advocated by Léle and Norgaard (2005), where researchers critically examine their normative assumptions and embrace epistemic humility.

In conclusion, *Mythos* stands at the vanguard of a scholarly revolution, one that recognizes interdisciplinarity not as a niche endeavor but as the cornerstone of addressing humanity’s most pressing challenges. By weaving together environmental stewardship, technological innovation, and socio-cultural equity, the journal can illuminate pathways toward a more just and sustainable future - one where knowledge is not fractured but unified in its diversity. As the legacy of wicked problems reminds us, the stakes are too high for anything less.

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