Research Report

Layer 4: Editorial Synthesis as a Governance Function in Scholarly Publishing

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Keywords: Knowledge infrastructure, Research dissemination, Publication ethics, Scholarly publishing, Reviewer scarcity, Decision-making

https://doi.org/10.5281/zenodo.22902754

The Writer's Camp Journal

Vol. 2, Issue 4, 2026

Background

Peer review remains central to scholarly publishing, yet increasing reviewer scarcity, delayed reviews, and fragmented evaluative input challenge traditional editorial workflows. Recent discussions of artificial intelligence (AI) have focused largely on its potential role in evaluation, while comparatively little attention has been paid to its use in supporting editorial synthesis and decision-making.

Purpose

To describe and examine Layer 4, a framework for AI-assisted editorial synthesis that supports governance and decision-making under conditions of reviewer scarcity and informational fragmentation.

Methods

A qualitative editorial case series examined 5 consecutive manuscripts processed through a structured Layer 4 workflow. AI-assisted tools were used to organize reviewer comments, identify areas of convergence and divergence, and support development of synthesis notes and decision language. Cases were analyzed to identify recurring functional patterns. An additional illustrative example demonstrated editorial synthesis using multiple human and AI-assisted reviews.

Results

Four recurring Layer 4 functions were identified: routine synthesis, capacity compensation, arbitration between divergent inputs, and diagnosis of non-convergence. Across cases, Layer 4 supported editorial reasoning when reviewer input was sparse, delayed, or conflicting. The illustrative example showed that Layer 4 functioned not as a voting mechanism but as a process of editorial diagnosis that transformed evaluative evidence into coherent judgment.

Conclusions

Layer 4 is proposed as a governance mechanism that supports editorial synthesis while preserving human responsibility for decisions. Reviewer reports provide evidence; editorial decisions require judgment. As reviewer scarcity and manuscript numbers increase, structured AI-assisted synthesis may help sustain accountable editorial decision-making without replacing peer review or editorial authority.

INTRODUCTION

Peer review remains a central mechanism of quality control in scholarly publishing, yet its practical operation increasingly reflects a system under sustained strain. Editors across disciplines report growing difficulty securing willing reviewers, prolonged decision timelines, and increasing reliance on a small and overextended pool of contributors.[1] At the same time, submission volumes continue to rise, further widening the gap between idealized editorial workflows and everyday reality.[2]

Despite these pressures, prevailing accounts of scholarly publishing often continue to assume a relatively stable process: multiple expert reviewers provide independent evaluations, which editors then integrate into a coherent decision. In practice, especially in small or discipline-anchored journals, editorial decisions are increasingly made with one or even zero external reviews, after extended de-

lays, or under conditions of significant informational fragmentation.

Recent discussions of generative artificial intelligence (AI) in scholarly publishing have largely focused on its potential role in automating or assisting evaluation. While such proposals highlight genuine opportunities for workflow support, they also raise concerns about bias, accountability, and the displacement of human judgment.[3] More fundamentally, they reflect a framing problem: they position AI as a substitute for judgment rather than as infrastructure for editorial cognition.[4,5]

A common assumption in discussions of peer review is that editorial decisions emerge directly from reviewer recommendations. In practice, however, reviewer reports constitute evidence rather than decisions. Editors must interpret, prioritize, reconcile, and contextualize reviewer input considering the manuscript, the journal's standards, and broader editorial considerations. The framework used here describes five editorial functions: technical and administrative checks; editorial triage and desk assessment; external peer review; internal editorial synthesis; and post-publication correction and governance. Layer 4 refers to the internal synthesis stage, in which the editor transforms manuscript, review, and journal evidence into a decision and its rationale.

The centrality of editorial responsibility in this process is also a matter of formal governance. The Committee on Publication Ethics (COPE) emphasizes that editors retain full responsibility for editorial decisions and that peer review functions in an advisory rather than determinative role.[6,7] Within this framework, tools and systems may support editorial work, but they cannot replace or assume responsibility for judgment.

Recent scholarship has increasingly documented the extent to which contemporary peer review operates under sustained capacity constraints. Across disciplines, rising submission volumes, declining reviewer availability, and prolonged decision timelines have been identified as systemic pressures that challenge the scalability of traditional review models.[4,8-10] Empirical and conceptual analyses alike describe a system characterized not only by workload burden, but by structural bottlenecks in reviewer recruitment, coordination, and editorial decision-making.

At the same time, the rapid emergence of AI in scholarly publishing has generated a parallel body of work examining its potential role in editorial processes. Current applications include manuscript screening, reviewer assignment, and detection of ethical or methodological concerns, with growing interest in AI-assisted support for editorial workflow.[11,12] However, significant debate remains regarding the appropriate scope of AI use. While some approaches frame AI as a potential replacement for aspects of peer review, others emphasize its role as infrastructure that can support human judgment without displacing it.[4,5]

Importantly, recent analyses highlight that the central challenge in contemporary peer review may not be the absence of evaluative input, but the difficulty of integrating sparse, delayed, or conflicting information into coherent editorial decisions.[5,9,10] This reframing shifts attention from evaluation alone to the broader problem of editorial synthesis under constraint—a function that remains underexamined in the literature despite its growing practical importance.

BACKGROUND: FROM PEER REVIEW AS RITUAL TO EDITORIAL SYSTEMS AS GOVERNANCE

Peer review is often treated in both policy and rhetoric as the defining mechanism of scholarly quality control. In practice, however, it operates within a much broader editorial governance system that includes technical screening, editorial triage, synthesis, production, and post-publication correction. These functions interact to sustain scholarly standards over time and cannot be reduced to any single step.

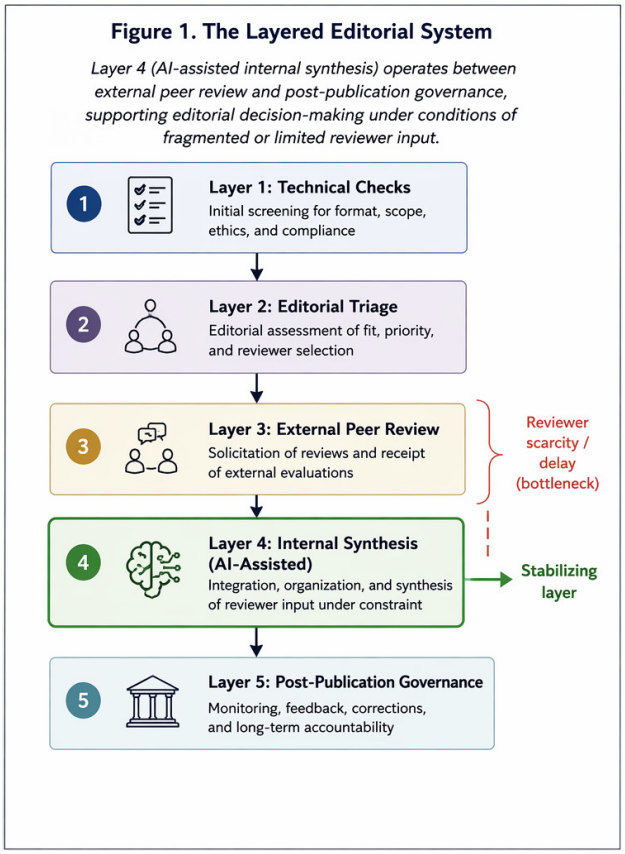
In prior work, the Journal Systems Framework (JSF) was introduced as a way of understanding how journals operate under varying structural and resource conditions.[13,14] A central insight of that framework is that many journals, particularly small or discipline-anchored titles, operate in a state of persistent capacity constraint. Under such conditions, editorial processes necessarily become adaptive: reviewer recruitment fails or stalls, timelines stretch, and editors increasingly rely on their own judgment and informal workarounds to keep the system functioning.

Rather than treating editorial decision-making as a single step centered solely on peer review, it is more accurate to understand it as a layered system in which different functions are carried out at different stages and by different personnel. Peer review occupies a central position, but it does not operate in isolation from the technical screening, editorial assessment, internal synthesis, and post-publication processes that give it meaning, structure, and consequence (see Figure 1).

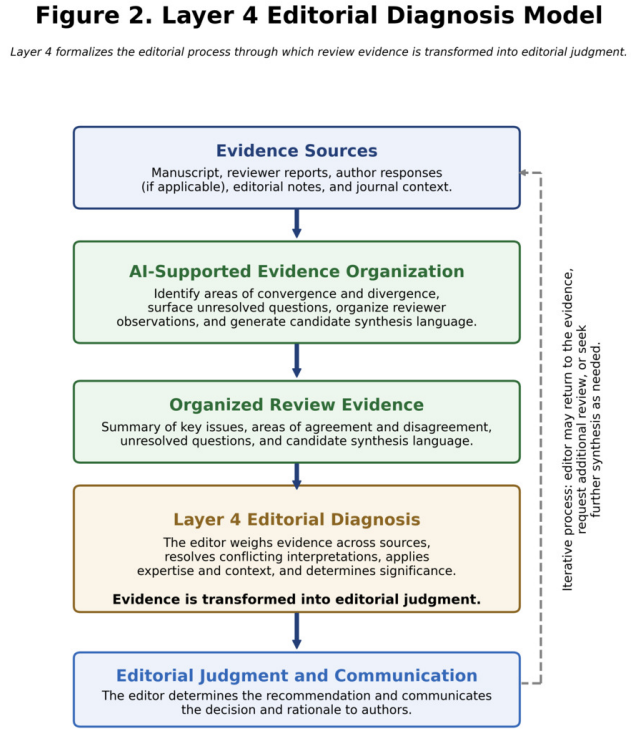
What has become increasingly visible in capacity-constrained contexts is that Layer 3, external peer review, has become the dominant bottleneck in the editorial system. Securing timely and sufficient reviewer input is increasingly difficult, and this scarcity propagates downstream.[8,9] The consequence is not the absence of decision-making, but a shift in where editorial labor concentrates: editors must compare incomplete or conflicting reviews, identify which concerns require action, and explain how the available evidence supports the decision. Layer 4 structures this work when external peer review does not provide the number, timeliness, or agreement of reports anticipated by the journal's usual process.

Editors already use software throughout the publication process, including manuscript management systems, plagiarism detection, reference checking, image screening, and production tools. They also use digital tools to search, compare, and annotate manuscripts and reviews. Layer 4 extends these familiar practices by using AI to organize review evidence and draft possible synthesis language, while leaving interpretation and decision-making with the editor (see Figure 2).

Against this conceptual and infrastructural backdrop, the use of Layer 4 in routine editorial practice rather than



Note. Figure generated with ChatGPT.



Note. Figure generated with ChatGPT.

as a hypothetical or experimental intervention was studied. The five cases reported here were not selected to demonstrate success or failure of a particular tool, but to reflect ordinary editorial conditions: reviewer scarcity, uneven response, and synthesis under constraint. To situate this framework within the broader literature on AI-assisted peer review and editorial systems, related approaches are briefly reviewed.

RELATED WORK AND DISTINCTION

Recent work on AI in peer review has explored a range of approaches to supporting editorial processes, including automated review generation, meta-review drafting, and decision-support systems.[15-18]

Tools such as *MetaWriter* have focused on generating draft meta-reviews from reviewer comments, positioning AI as a writing support tool for summarizing external evaluations.[15] Other systems, such as *ReviewerToo*, propose hybrid human–AI pipelines in which AI contributes directly to the generation of review contents.[16] Additional approaches, including uncertainty-aware aggregation models, aim to provide editors with probabilistic recommendations based on multiple reviewer inputs,[18] while optimization-based models focus on improving reviewer assignment and workflow efficiency under conditions of constraint.[17]

While these approaches address important aspects of peer review, they largely frame AI as a mechanism for augmenting or replacing elements of evaluation. In contrast, the Layer 4 framework proposed here is explicitly editor-controlled and oriented toward synthesis rather than evaluation. It does not generate reviews, assign recommendations, or optimize workflow processes. Instead, it supports the editor's role in integrating sparse, delayed, or conflicting inputs into coherent, accountable decisions under conditions of capacity constraint.

In this sense, Layer 4 is best understood not as an alternative to existing AI-assisted review systems, but as a distinct layer of editorial infrastructure that operates alongside them, addressing a different and underexamined problem: the governance of synthesis under constraint.

METHODS

This study used a qualitative editorial case series design to examine the role of AI-assisted internal synthesis (Layer 4) in real-world editorial decision-making. The unit of analysis is the editorial process surrounding individual manuscripts, rather than the manuscripts themselves or their authors. The cases consist of five consecutive manuscripts processed using a structured Layer 4 workflow during a defined editorial period.

Artificial intelligence-assisted synthesis was conducted using commercially available large language model (LLM) tools (SciSpace; ChatGPT; Claude) accessed through secure interfaces via subscription or the no-cost tier. These tools were used solely to support editorial synthesis, including organizing reviewer comments, identifying areas of convergence and divergence, generating structured summaries, and assisting in the drafting of internal synthesis notes and decision language. In some cases, additional AI-assisted review outputs generated through external scholarly analysis

platforms were incorporated as supplementary sources of evaluative information.

In practice, AI tools were used in two distinct ways. First, SciSpace's Peer Reviewer function was used to generate independent review reports for selected manuscripts, producing structured critiques and recommendations analogous to those provided by human reviewers. These AI-generated reviews were analyzed alongside human peer-review reports as part of the study dataset. Second, conversational AI tools were used to support editorial analysis by summarizing reviewer comments, identifying areas of agreement and disagreement, exploring recurring themes, and organizing key issues into draft synthesis notes. Outputs included review reports, structured summaries, comparative analyses, and candidate decision language. All outputs were reviewed, interpreted, and, where applicable, revised by the editor. Editorial decisions remained the responsibility of the editor and were not delegated to AI systems.

All use of AI-assisted tools was conducted in a manner consistent with editorial confidentiality obligations. Manuscripts, reviewer reports, and internal notes were processed through access-controlled interfaces used by the editor. Where appropriate, identifying details were minimized or omitted during processing. AI-assisted outputs were used only for the editorial purposes described in this study and were not independently redistributed or used for secondary purposes by the editor. This use is analogous to other routine editorial technologies (e.g., manuscript management systems, plagiarism detection, reference-checking software), in which confidential materials are processed within controlled environments to support editorial work.

The use of consecutive cases was intended to minimize selection bias and to capture routine editorial conditions rather than exceptional or illustrative examples. The number of cases is consistent with qualitative case series approaches focused on identifying recurring functional patterns rather than statistical generalization.[19]

For each case, submission date; number of reviewers invited and accepted; dates of reviews, revisions, and decisions; final outcome; and total elapsed time were recorded. Each case was examined individually and then comparatively to identify recurring functional patterns. Patterns were identified through iterative comparative reading across cases, consistent with qualitative cross-case analysis methods. Four recurring roles were identified: routine synthesis, capacity compensation, arbitration between divergent inputs, and diagnosis of non-convergence.

All cases were anonymized. No manuscript or reviewer text is quoted. The study examined editorial processes rather than human subjects and therefore did not undergo IRB review.

RESULTS

Five consecutive editorial cases processed using the Layer 4 synthesis workflow were examined. Across these cases, manuscripts varied widely in topic, review context, reviewer availability, and time in process, which ranged from approximately 12 days to more than 6 months. The number of reviewer invitations ranged from 3 to 9. Standard recruitment yielded between 0 and 2 completed reviews; in the case with no completed review through standard channels, one review was subsequently obtained through the editor's professional network. Final outcomes included acceptance, tentative acceptance pending revision, and rejection with recommendation for full rewrite. Table 1 summarizes the basic process characteristics of the five cases.

Across the cases, 4 recurring functions of Layer 4 were observed: 1) routine synthesis, 2) capacity compensation, 3) arbitration, and 4) diagnosis of non-convergence. While individual cases sometimes illustrated more than one function, each case is described below in terms of the dominant role Layer 4 played in the editorial process.

CASE 1: ROUTINE SYNTHESIS

Case 1 represents a relatively straightforward editorial trajectory in which 2 aligned, generally positive reviews were obtained after 8 reviewer invitations. Although the reviewer recruitment effort was nontrivial, the content of the reviews converged in both assessment and recommendations. Both reviewers emphasized clarity of argument and requested minor refinements to structure and citation, with substantial overlap in suggested revisions. The primary function of Layer 4 in this case was routine synthesis: organizing overlapping comments, clarifying priorities among revision requests, and producing a coherent editorial decision letter that preserved the substance and tone of both reviews. The final decision was acceptance pending minor revisions.

CASE 2: CAPACITY COMPENSATION AND ARBITRATION

Case 2 illustrates a situation in which only a single review was obtained despite 8 reviewer invitations. Moreover, the review that was received diverged substantially from the editor's own assessment of the manuscript. The reviewer emphasized concerns about methodological rigor and recommended major revision, while the editor's assessment identified the manuscript as conceptually strong but in need of targeted clarification rather than structural overhaul. In this context, Layer 4 served two functions.

First, it supported capacity compensation by helping structure and contextualize a decision in the absence of multiple external perspectives. Second, it supported arbitration by clarifying the points of disagreement between the reviewer's critique and the editor's judgment, and by distinguishing between concerns that required substantive revision and those that reflected differences in framing or emphasis. The final decision was a tentative acceptance pending revision.

CASE 3: DIAGNOSIS OF NON-CONVERGENCE

Case 3 involved a manuscript with a prolonged and irregular review history. Only one external review was obtained. After an initial decision and a delayed revision cycle, further synthesis indicated that the manuscript's conceptual and structural problems were not converging toward a pub-

Table 1. Characteristics of the Five Editorial Cases and Primary Layer 4 Functions

Case	Reviewers Invited / Accepted	Time in Process	Decision	Primary Layer 4 Function(s)
Case 1	8 / 2	~5 weeks	Accept pending minor revisions	Routine synthesis
Case 2	8 / 1	~12 days	Tentative accept	Capacity compensation; Arbitration
Case 3	4 / 1	~6.5 months	Reject; full rewrite	Diagnosis of non-convergence
Case 4	9 / 0 (+1 network)	~3+ months	Reject; rebuild	Capacity compensation
Case 5	3 / 1	~5.5 months	Accept	Routine synthesis; Capacity compensation

lishable form but instead reflected a more fundamental mismatch between the current manuscript and the journal's expectations. Revisions addressed surface-level issues such as organization and wording but did not resolve underlying conceptual inconsistencies identified in the initial assessment.

Here, the primary function of Layer 4 was diagnosis of non-convergence: recognizing that continued incremental revision was unlikely to succeed and that the most responsible editorial action was to recommend a full reconceptualization rather than further rounds of revision. The final decision was rejection with invitation for a complete rewrite.

CASE 4: CAPACITY COMPENSATION UNDER EXTREME CONSTRAINT

Case 4 represents an extreme example of reviewer recruitment failure. Despite 9 invitations, no usable external reviews were obtained through normal channels, and only one review was ultimately secured through the editor's personal network. In this context, Layer 4 functioned primarily as capacity compensation. Synthesis focused on integrating the limited external input with the editor's own assessment to produce a fair and transparent decision. The single available review provided general concerns about clarity and contribution but lacked sufficient specificity to guide revision, requiring the editor to rely more heavily on internal assessment. The final decision was rejection with invitation for a full rewrite of the manuscript.

CASE 5: COMBINED ROUTINE SYNTHESIS AND CAPACITY COMPENSATION

Case 5 involved a delayed and uneven review process in which only one external review was obtained after 3 invitations. After a late revision, synthesis supported a final decision to accept the manuscript. Here, Layer 4 combined elements of routine synthesis and capacity compensation: organizing the available review input, integrating it with editorial assessment, and producing a coherent decision in a thin-review context. The external review focused primarily on presentation and clarity, while the editor's synthesis incorporated additional conceptual and structural considerations in forming the final decision.

CROSS-CASE PATTERNS

Considered as a whole, these 5 cases illustrate that Layer 4 is not a special-purpose intervention reserved for exceptional circumstances. It functions across a spectrum of ordinary editorial situations: when reviews align, when they are sparse, when they diverge, and when manuscripts fail to converge despite extended effort. Across cases, the consistent role of Layer 4 is not to evaluate manuscripts, but to stabilize editorial reasoning under conditions of informational scarcity, delay, and fragmentation.

ILLUSTRATIVE EXAMPLE: LAYER 4 AS EDITORIAL DIAGNOSIS

The 5 cases presented above demonstrate recurring functions of Layer 4 under conditions of reviewer scarcity and capacity constraint. A complementary example illustrates how Layer 4 operates when multiple forms of evaluative input are available but require synthesis into a coherent editorial judgment.

A manuscript was reviewed by 3 reviewers, supplemented by an independent AI-assisted methodological review. The reviews identified several concerns, including manuscript organization, conceptual framing, presentation of findings, and interpretation of results. Although individual recommendations varied, a pattern of convergence emerged regarding the need to strengthen the manuscript's narrative structure and improve communication of its central contribution.

Layer 4 synthesis focused not on counting recommendations or averaging reviewer judgments but on identifying the underlying diagnosis suggested across reviews. The synthesis indicated that the manuscript's primary weaknesses were presentational rather than methodological. Reviewers consistently recognized the value of the dataset and the importance of the research question, while expressing concern about organization, framing, and accessibility of findings. Particular attention centered on the presentation and interpretation of the only table included in the manuscript, which emerged as a recurring point of concern across multiple reviews.

The resulting editorial synthesis concluded that the manuscript contained a meaningful scholarly contribution but required substantial revision to improve clarity, positioning, and communication of results. Rather than treat-

ing reviewer recommendations as votes, Layer 4 functioned as a process of editorial diagnosis that transformed multiple forms of evaluative evidence into a coherent judgment. The resulting editorial decision was to invite revision and resubmission.

DISCUSSION

This case series illustrates how Layer 4 functions in practice not as a substitute for peer review or editorial judgment, but as editorial infrastructure supporting governance under conditions of chronic capacity constraint. Across 5 ordinary editorial cases, Layer 4 served to organize fragmented inputs, compensate for limited reviewer availability, arbitrate between divergent perspectives, and diagnose non-convergent revision trajectories.

Taken together, these cases highlight an important distinction between reviewer evaluation and editorial judgment. Reviewer reports provide evidence regarding a manuscript's strengths, weaknesses, and areas requiring attention. Editorial decisions, however, require interpretation of that evidence within a broader governance framework. Layer 4 does not aggregate recommendations mechanically or function as a voting system. Instead, it supports the editor's work of identifying patterns, diagnosing underlying issues, and translating fragmented evaluations into coherent and accountable decisions. In this sense, Layer 4 serves as a bridge between evidence and judgment.

In doing so, it makes explicit a form of editorial work that is increasingly central but rarely described: synthesis under constraint. In this context, governance is not limited to formal policy structures but is enacted through the processes by which editorial decisions are made, justified, and communicated. By structuring the synthesis of fragmented inputs into coherent and accountable decisions, Layer 4 directly supports this operational dimension of editorial governance.

COPE guidance emphasizes that editors retain full responsibility for editorial decisions and that peer review is advisory rather than determinative.[6] COPE also emphasizes that reviewer reports should ordinarily be transmitted to authors in their original form, with editorial discretion limited to issues of tone, relevance, or appropriateness.[20] In capacity-constrained systems, reviews may be partial, overlapping, contradictory, or poorly structured; editors must preserve their integrity while producing coherent, prioritized decision letters.

Layer 4 does not evaluate manuscripts, generate reviews, or decide outcomes. Its function is to support the editor's work of organizing, clarifying, and prioritizing complex and fragmented information. Crucially, this work is performed without altering or replacing the original reviewer reports. Reviews continue to be transmitted to authors in their original form, consistent with COPE guidance on faithful transmission of peer review.[20] Layer 4 therefore supports the editor in comparing and prioritizing reviewer concerns without screening out, rewriting, or replacing the reports sent to authors.

The use of AI-assisted synthesis in editorial workflows also raises important ethical considerations related to transparency, bias, and accountability. Although Layer 4 is explicitly designed to support, rather than replace, editorial judgment, its use introduces an additional layer of mediation that may not be visible to authors or reviewers. In this study, all synthesis activities remained under direct editorial control, and original reviewer reports were preserved and transmitted without alteration, consistent with COPE guidance.[20]

For broader implementation, practical safeguards should include transparency regarding AI-assisted synthesis, monitoring for systematic bias, and maintenance of audit trails documenting prompts, outputs, and editorial revisions. Responsibility for all editorial decisions remains with the editor, and AI-assisted outputs should be treated as provisional working documents rather than authoritative interpretations. These safeguards reflect the broader need to align emerging editorial technologies with established principles of fairness, transparency, and accountability in scholarly publishing.

Layer 4 is most applicable in editorial contexts characterized by reviewer scarcity, delayed or uneven input, and the need for synthesis under constraint. Its value may be less pronounced in well-resourced systems with consistent access to multiple high-quality reviews. Layer 4 does not substitute for disciplinary expertise or compensate for fundamentally weak manuscripts; responsibility for all decisions remains with the editor. Layer 4 is most warranted when an editor cannot identify a clear synthesis from reviewer inputs without extended deliberation.

Layer 4 is most effective when applied selectively rather than universally. It is particularly useful in cases requiring arbitration between divergent reviews, compensation for limited reviewer input, or diagnosis of non-convergent revisions. In routine cases with strong reviewer agreement, its use may offer efficiency but is not essential. This selective application reinforces the role of the editor as the primary agent of judgment, with AI serving as structured support for synthesis under constraint.

AI-assisted synthesis introduces risks including mischaracterization of reviewer intent, omission of concerns, and overreliance on structured outputs. These risks can be mitigated through direct review of source materials, verification of summaries, and maintenance of editorial responsibility for all decisions.

This is a methods and governance contribution, not an outcome study. The cases do not demonstrate that Layer 4 produces better decisions in any external sense; they demonstrate that structured, AI-assisted synthesis can stabilize editorial reasoning under constraint, support arbitration, and prevent non-convergent cycles from consuming further resources. The study is limited to a small number of cases in a single context and does not claim generalizability.

CONCLUSION

This study does not propose a new theory of peer review, nor does it argue for the automation of editorial judgment. Instead, it makes a narrower and more pragmatic claim: that in contemporary editorial systems, particularly those operating under persistent capacity constraints, the central governance challenge is no longer the generation of evaluative opinion, but the synthesis of incomplete, delayed, and uneven information into coherent, accountable decisions. Reviewer reports provide evidence; editorial decisions require judgment. Layer 4 is proposed as a structured mechanism for transforming one into the other.

The cases examined here show that this work of synthesis is already unavoidable. Editors routinely make consequential decisions with far less external input than the idealized peer review model presumes. Layer 4 does not create this reality; it names and structures it. By making synthesis explicit, documented, and internally coherent, Layer 4 offers a way to stabilize editorial judgment under conditions where Layer 3, external peer review, can no longer be relied upon to function at scale.

Importantly, this is not a claim about efficiency or optimization. It is a claim about governance. Framed within COPE's core principles, Layer 4 should be understood as an effort to preserve editorial responsibility, not to dilute it. Judgment remains human, accountable, and situated. The role of AI in this model is strictly infrastructural: to support the editor's cognitive work, not to replace it.

Finally, this work should be read as a methods and governance contribution, not as an outcome study. The cases presented here do not demonstrate that Layer 4 produces better decisions in any external or measurable sense. They demonstrate something more basic and necessary: that structured, AI-assisted synthesis can support editors in doing the work they are already ethically required to do, under conditions that increasingly make that work difficult. If peer review is to remain a credible instrument of scholarly governance, it will not be because its ideals are defended in the abstract, but because its supporting editorial infrastructure is redesigned to match the realities under which it now operates.

Submitted: June 18, 2026 EDT. Revised: August 13, 2026 EDT. Accepted: September 13, 2026 EDT. Published: November 05, 2026 EDT.

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