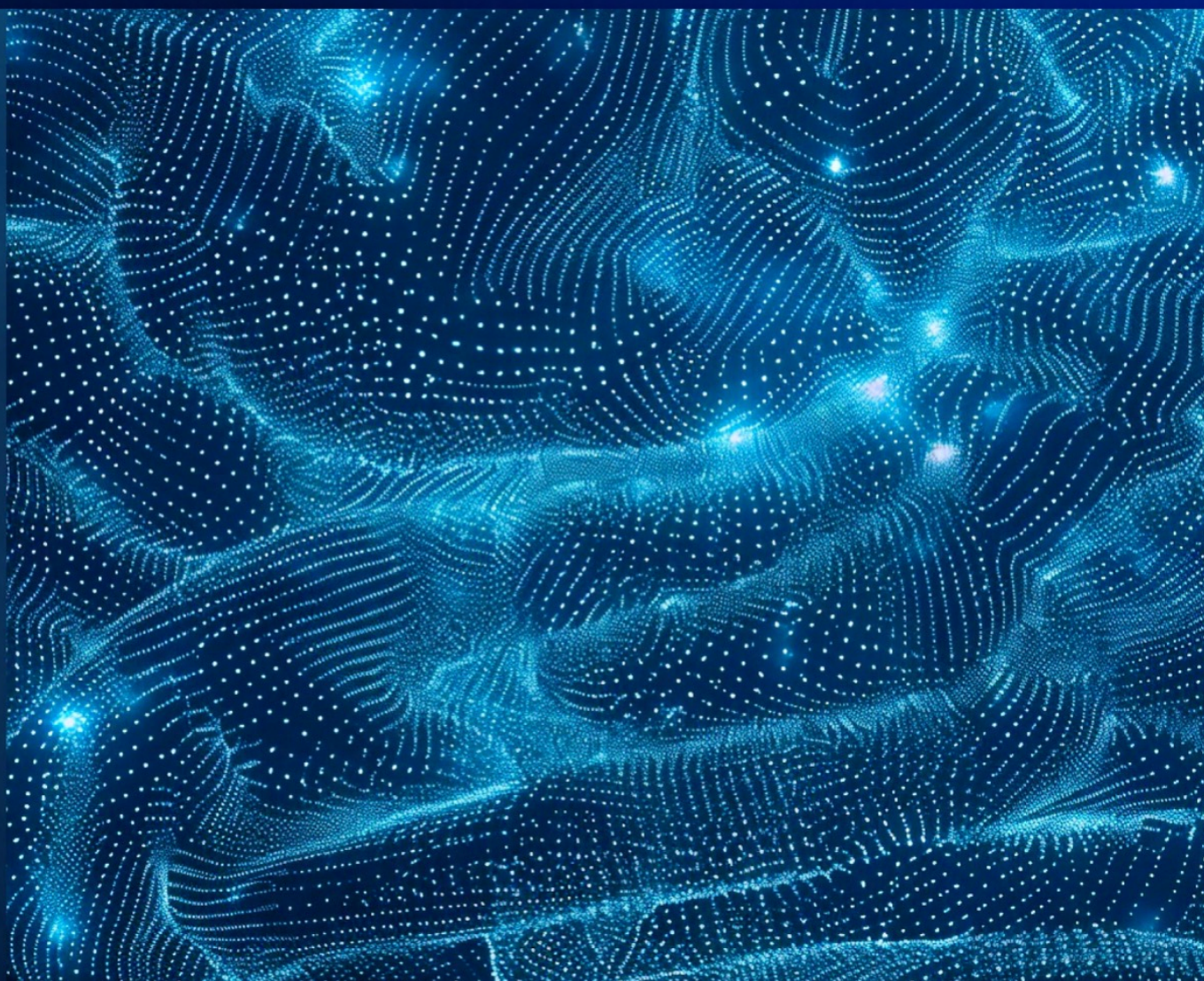


Unlocking AI's untapped potential: responsible innovation in research and publishing



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Foreword

Frontiers was established to strengthen peer review – the foundation of scientific trust – by combining openness, collaboration, and technological innovation. Today, that same vision guides how we approach artificial intelligence.

AI holds immense potential to transform scientific research, and its responsible integration stands among the field's greatest opportunities to help publishers deliver rigorous, fair, and efficient peer review.

AI has already redefined the authoring process for scientific research, but it is now quietly reshaping how it is reviewed. Our 2025 global survey reveals that while AI is steadily finding its place in peer review, its full potential is currently untapped. Today, it is often used for surface tasks, like polishing language, drafting text, or handling administration, rather than for deeper analytical and methodological work where it could truly elevate rigor, reproducibility, and scientific discovery.

At the same time, the unethical use of AI to mass-produce low-quality or fabricated research poses new challenges for peer review. But these risks only sharpen the imperative to harness AI as a force to combat fraud; one that scales quality and strengthens integrity across the entire research cycle. With the right leadership and guardrails, AI can act as an elevator for research quality, rather than a shortcut around it.

This study, the first of its kind, captures the realities of AI adoption, researchers' perceptions, and the challenges shaping its integration in research. Unlike previous surveys, we also measure where and how researchers seek AI training and identify critical governance shortfalls across institutions and publishers.

Frontiers has long been a pioneer in using artificial intelligence to support academic publishing at scale. Our unique three-pronged approach to quality combines the human expertise of our editorial boards, our in-house teams, and our own AI tools. Our AI assistant (AIRA) supports review by performing quality checks that would be impossible at scale through human effort alone – but always in conjunction with human validation. We've published policies for authors, editors, and reviewers that encourage responsible and transparent use of generative AI technologies throughout the publishing process.

Drawing on our own AI journey and informed by insights from the global research community, this report is our call to action: a catalyst for responsible transformation. It explores what stakeholders across the entire research ecosystem – from funders to individual reviewers – can do to guide innovative AI usage so that it translates into impact. We're excited to lead by example on this journey toward a future where rigorously reviewed, open research is truly enhanced by AI and helps society find the solutions it needs for healthy lives on a healthy planet.



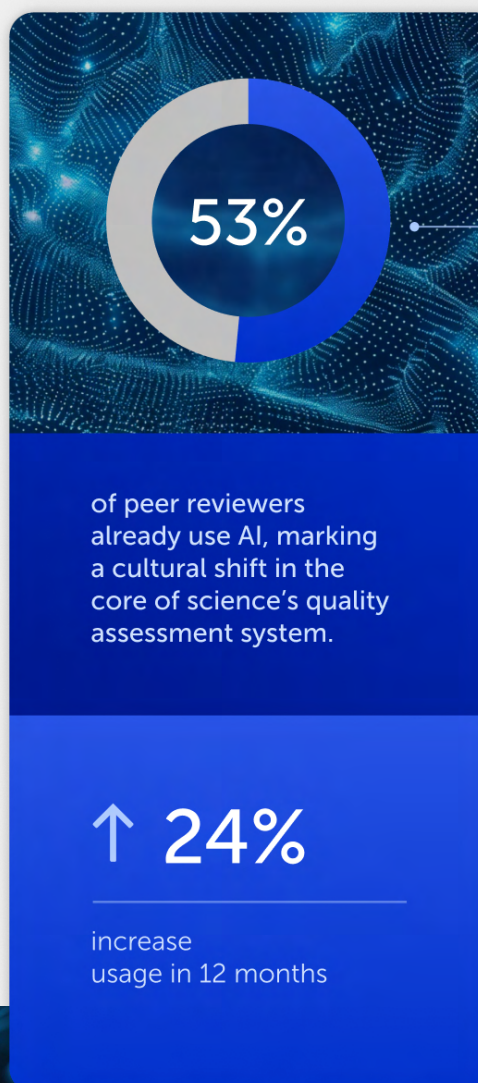
Kamila Markram
CEO and co-founder,
Frontiers



Executive summary

Key findings

The quiet revolution The rise of AI in peer review

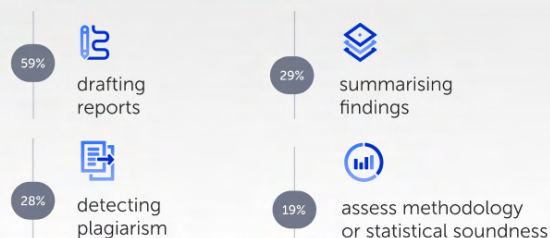


AI is no longer just assisting authors; it is transforming how research is evaluated.

But even though more reviewers are using AI, regular use remains a minority behaviour.

Untapped potential: surface use dominates

How peer reviewers use AI



Even in authoring, this pattern persists — leaving major potential untapped



Researchers are ahead of governance

Lack of guidance or unclear rules is a barrier to AI use

When asked about barriers, 20% of free text responses cited a lack of guidance or unclear rules as their top barrier to responsible AI use.

Researchers are eager but under-supported

35%

are self-taught

18%

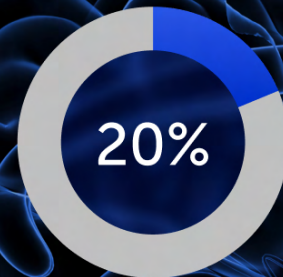
take no action at all to ensure best practice

16%

receive training from publishers



This highlights an opportunity for institutions and publishers to provide more structured support



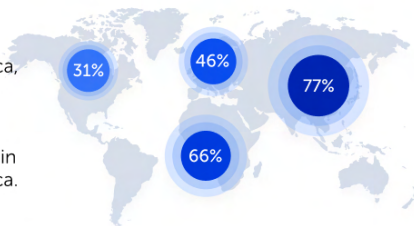
cited a lack of guidance or unclear rules as their top barrier to responsible AI use.

Global and generational insights inform how to unlock AI's potential in research

Tackling both regional and generational barriers will be key to achieving equitable, trusted, and effective global AI adoption across the research ecosystem.

Regional divides

AI use in peer review is highest in China and Africa, where it is often used for improving writing, translation, and reporting accuracy. Usage is lower in Europe and North America.



Generational gaps

87%

Early career

67%

Senior

Researchers

87% of early career researchers use AI compared to 67% of senior researchers in the preparation and publication of their articles.

61%

Early career

45%

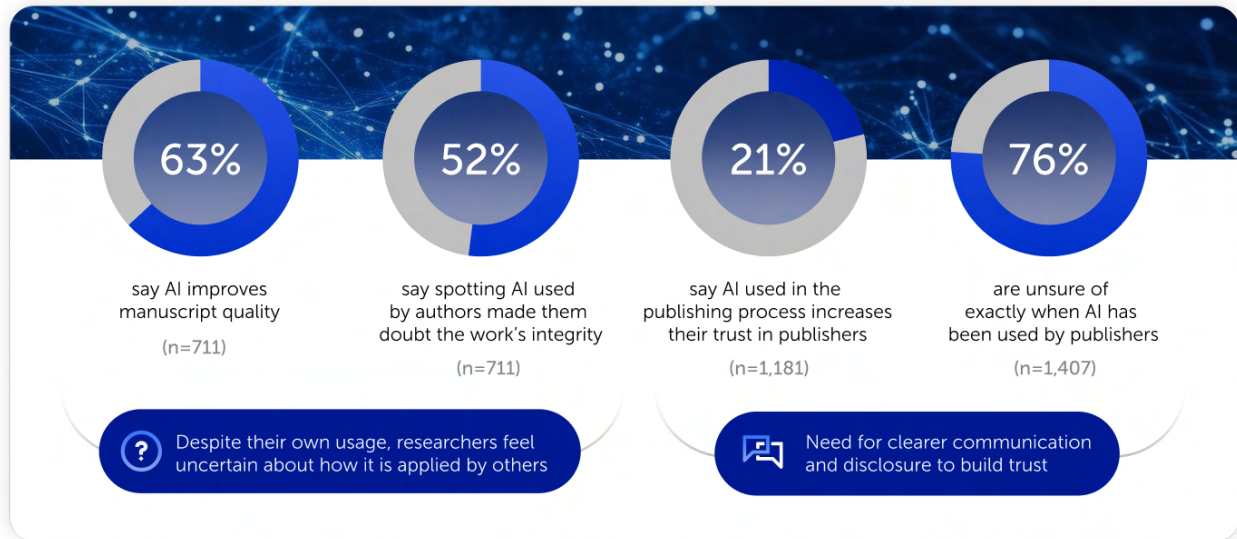
Senior

Reviewers

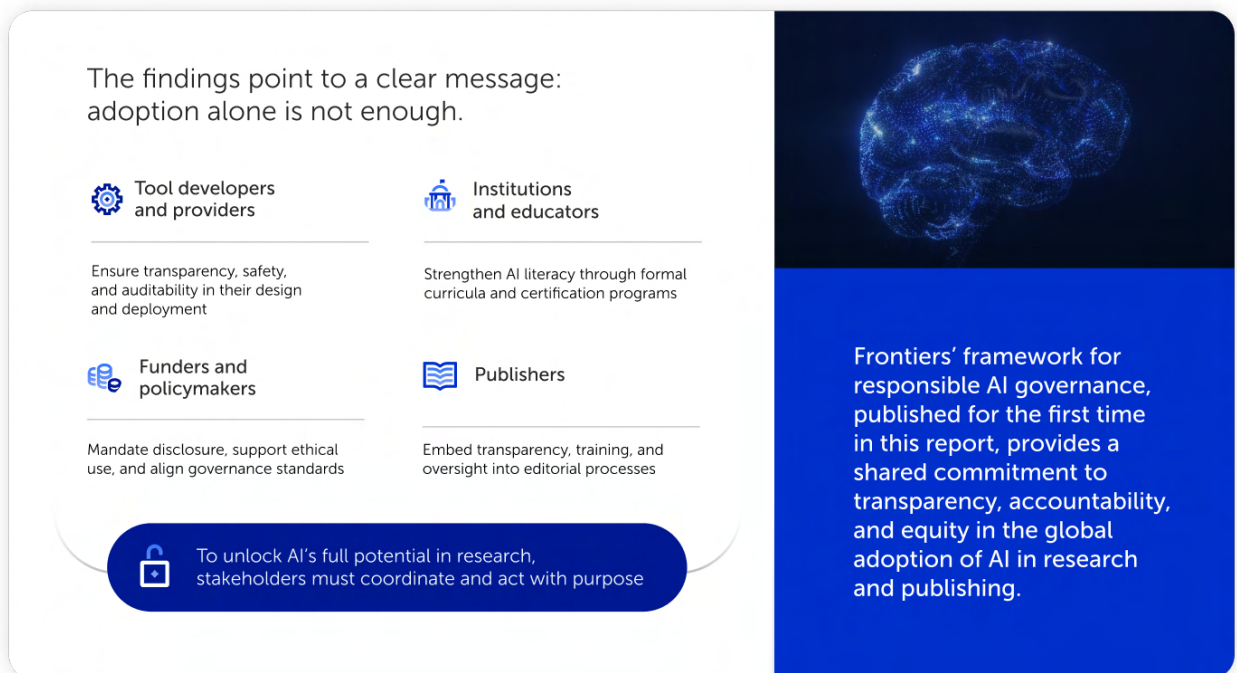
61% of early career researchers use AI when peer reviewing, compared with 45% of senior researchers.

Early career <5 years publishing experience; Senior >15 years publishing experience

Call to action: turning insight into impact



Closing the trust gap can increase confidence



Methodology



The quiet revolution

The rise of AI in peer review

While AI's impact on research writing has been widely reported and impossible to ignore, its quiet rise in peer review tells a subtler story – one of steady normalization and experimentation, but enormous untapped potential.

Harnessing AI purposefully is essential to shaping the industry's conversation about the future of peer review, a process long challenged by issues of sustainability, transparency, and fairness. Used responsibly, AI can ease these pressures and reinforce trust in the evaluation of science. Peer review is where the next wave of meaningful progress will come from.

53%
use AI for
review

Our findings show that more than half of peer reviewers (53%) now use AI, marking a profound cultural shift from traditional peer review to one that increasingly integrates AI tools.

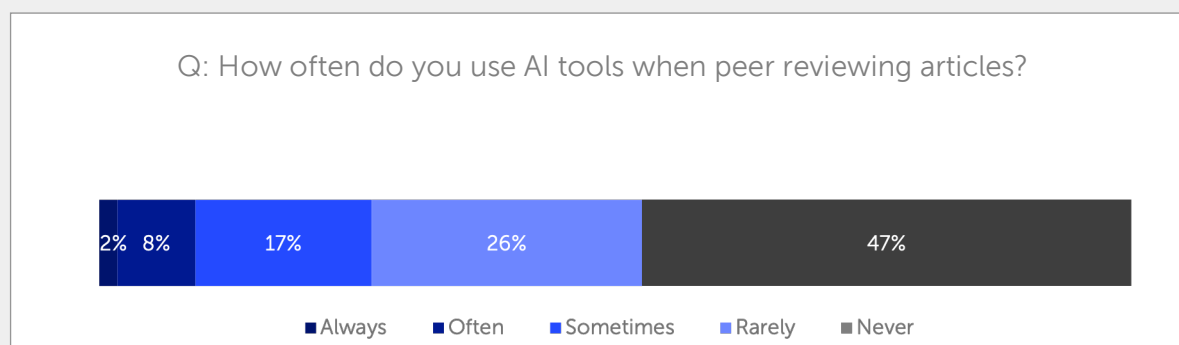


Figure 1: AI usage for reviewing. We asked: how often do you use artificial intelligence (AI) tools when peer reviewing articles? (n=909)

Adoption trends reveal that nearly one in four reviewers (24%) have increased their AI use in the past year, signaling progressive normalization. Regular use remains limited, though – a reminder that normalization is only the first step toward confident adoption.



As my proficiency with AI tools improves, I gain confidence in their use, and I must say they are very useful in all stages of peer reviewing, but I still need to improve my practice.

– Senior researcher
Environmental sciences
Italy



I had never used AI to help with peer review until the last four months or so. It has substantially cut down on time needed for each review.

– Assistant professor
Health and biomedicine science
USA

24%
increased
usage

Use of AI within peer review is beginning to catch up with AI for authoring activities: a key turning point. AI now supports both sides of the research dialogue: writing and evaluation. Together, these developments pave the way for a more efficient and consistent system of communication in research publishing.

Q: How has your use of AI when peer reviewing changed in the past year?

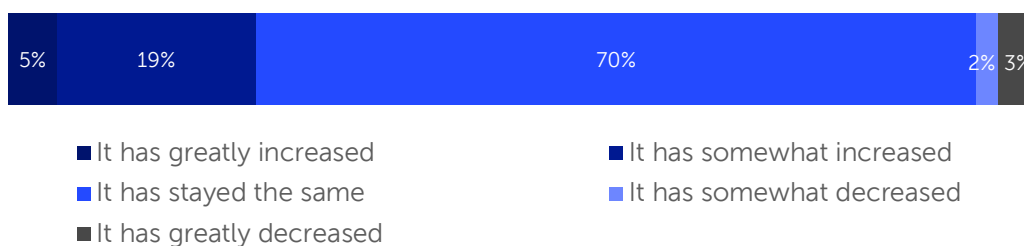


Figure 2: increase in AI usage for review. We asked: how has your usage of AI when peer reviewing changed over the last 12 months? (n=909)

Surface use, deep potential: how AI is (and isn't) being used

Across the research cycle we see the same theme: surface use, deep potential.

In peer review, the reviewers using AI mostly use it to draft reports (59%), summarize findings (29%), or flag potential misconduct (28%).

On the surface, these use cases show great potential for AI to ease reviewer fatigue, improve consistency, and support integrity checks – important outcomes that make better use of reviewers' time and expertise while addressing common concerns about the sustainability and efficacy of peer review.

Yet AI's transformative potential in peer review lies in its capacity to help reviewers interrogate data, test statistical soundness, and explore alternative methodological approaches – always with human oversight and accountability.



AI tools have become more reliable: they've enabled me to streamline repetitive tasks like formatting references or checking grammar, allowing me to focus more on the core scientific content. Additionally, AI has been helpful in improving clarity and structure during manuscript drafting, especially when communicating complex findings to a broader audience.

—
Physical sciences
India

Only 19% report using AI for these analytical tasks, revealing a key gap in the application of AI to strengthen scientific quality.

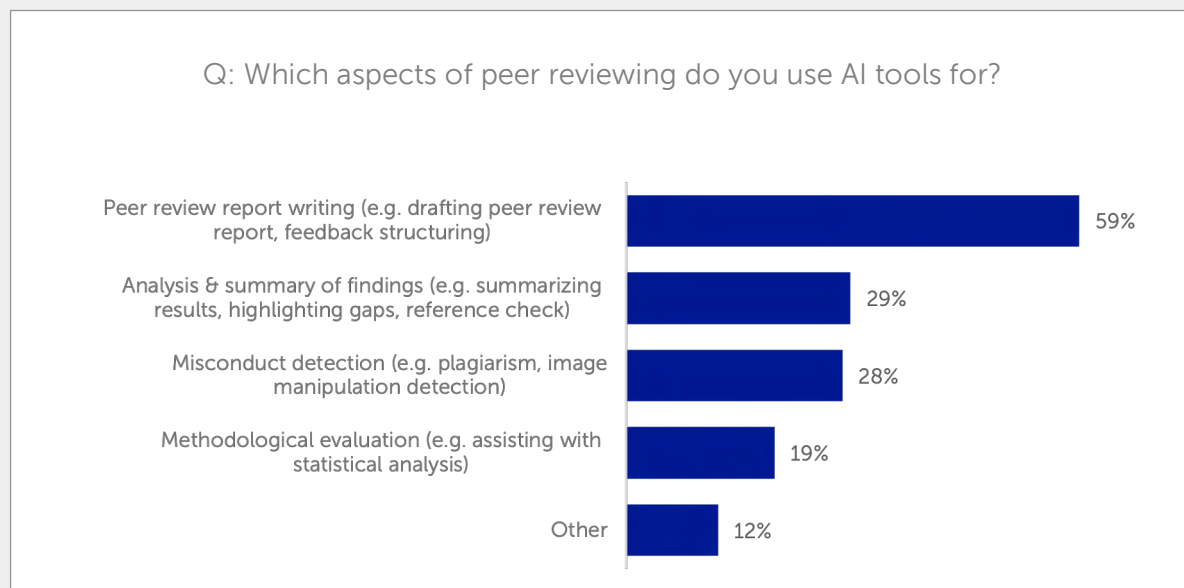


Figure 3: Patterns of AI usage by reviewers. We asked: Have you used AI to improve any of the following aspects in your role as a peer reviewer? (n=477). Respondents could select more than one response.

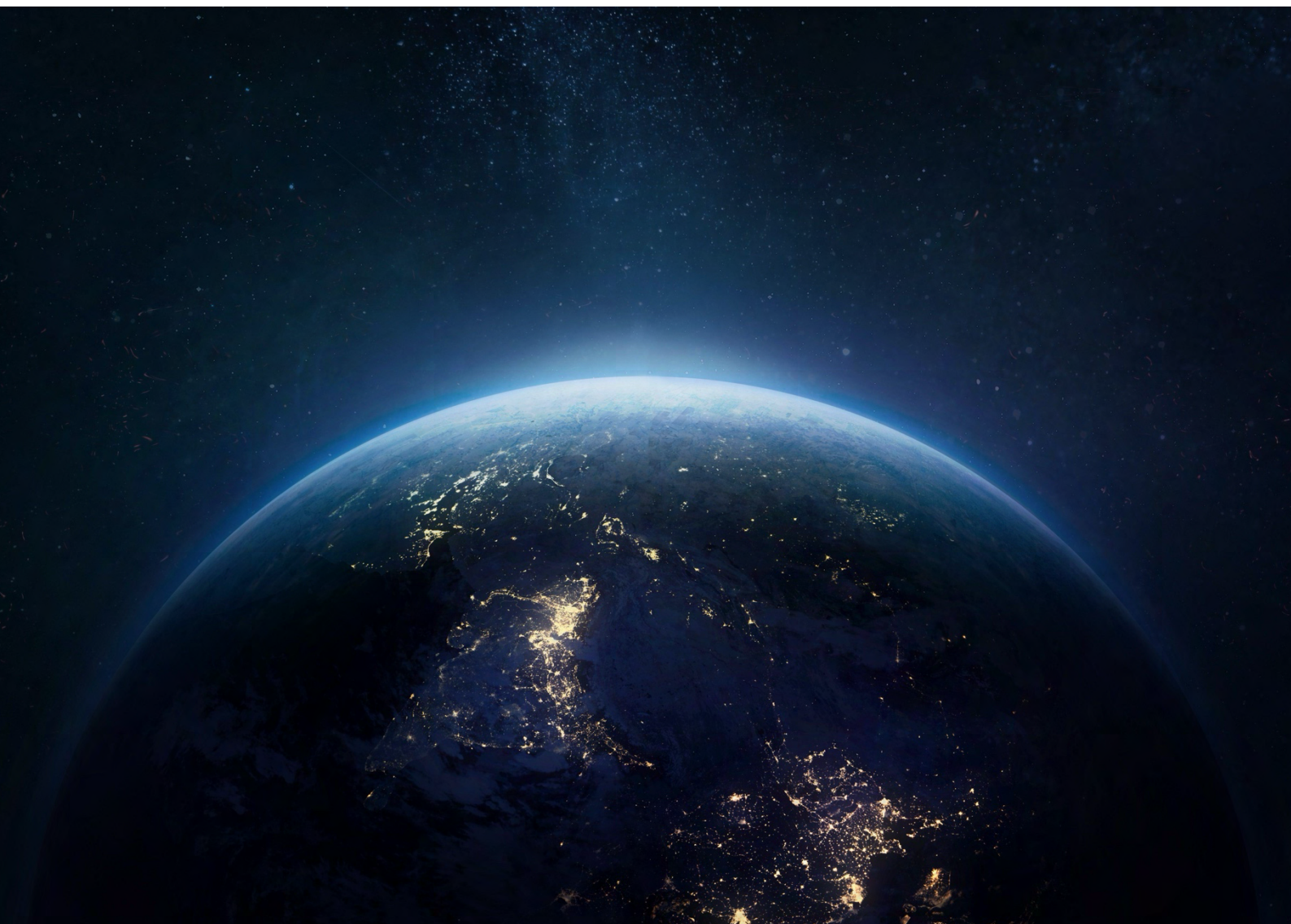
Among those using AI, 28% are using it to detect misconduct; this reflects a **growing awareness of integrity-focused tools**. However, such checks are typically handled by publishers and research integrity teams at various stages of the process, using specialized detection systems and expert validation methods. These tools provide crucial contextual analyses that many reviewers cannot perform because they lack the necessary data access or expertise.

Consequently, using AI during peer review to identify misconduct may be misplaced, highlighting a need to raise awareness about how AI can most empower reviewers: supporting deeper scientific insight, methodological critique, and constructive feedback, rather than replacing integrity checks handled by specialized teams.

Untapped potential remains not only in **where** AI is used across the research cycle – from conceptual design to peer review to writing and publishing – but in **how** it is applied at each stage. Of researchers who are using AI for authoring, 70% specifically use it for improving their writing like enhancing clarity, grammar and formatting, yet fewer than one in four use it for conceptual design, analysis, or methodology, the areas where AI could most elevate rigor, reproducibility and scientific progress.

This pattern shows a transformative truth: AI's most profound potential lies not in its widespread presence, but in its strategic, analytical deployment.

The genuine leap forward will not come from simply accelerating routine work, but from deeper and smarter application to the very foundations of scientific research. Instead of merely speeding up tasks, we can look toward a future where AI strengthens scientific integrity: enhancing rigor, guaranteeing reproducibility, and elevating the innovative research process.



Unlocking AI's potential globally and across generations

AI adoption in research is accelerating worldwide, though unevenly. Regional and generational differences reveal drivers and barriers shaping its use, and these insights are key to unlocking AI's full potential across the research cycle.

Focusing on review activities, **adoption is led by China and Africa** where 77% and 66% of reviewers respectively use AI tools at least occasionally. In these regions, AI is seen as an empowerment tool, improving writing, translation, and reporting accuracy, and helping non-native English speakers overcome language barriers to participation.

Researchers in high adoption regions consider AI as an equalizer rather than a threat, emphasizing its practical value in enhancing communication and inclusion.

By contrast, adoption remains limited in Europe and north America. Only 31% of North American and 46% of European reviewers have used AI for peer review at any frequency, with most citing concerns about bias, misuse, and transparency. These reflect a cultural focus on ethics, trust, and policy readiness rather than access or capability.

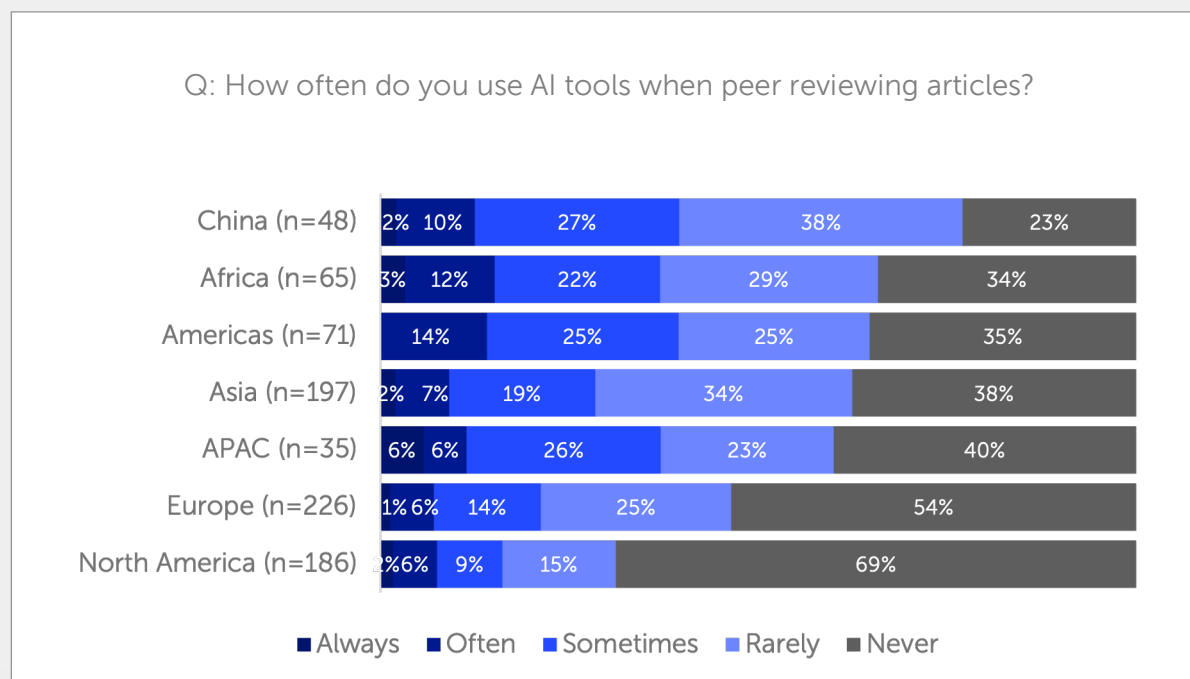


Figure 4: global differences in AI usage for reviewing. We asked: How often do you use artificial intelligence (AI) tools when peer reviewing articles?

These regional contrasts reveal that AI's potential is unevenly unlocked, and that targeted strategies are needed to support AI innovation globally. Regions where adoption is expanding rapidly may benefit from enhanced tools and training, while those with more established governance frameworks can focus on strengthening trust and oversight.

Generational differences also reveal uneven patterns of AI adoption across research and peer review, highlighting again the need for targeted strategies to support AI at every experience level.

AI use is near-universal among early career researchers (87%), compared with 67% of senior researchers. Early career reviewers are also far more likely to use AI regularly.

61% of those with five or fewer years of experience use AI tools for review, compared to just 45% among those with over 15 years. Senior reviewers are the only group where the majority (55%) have never used AI in peer review.

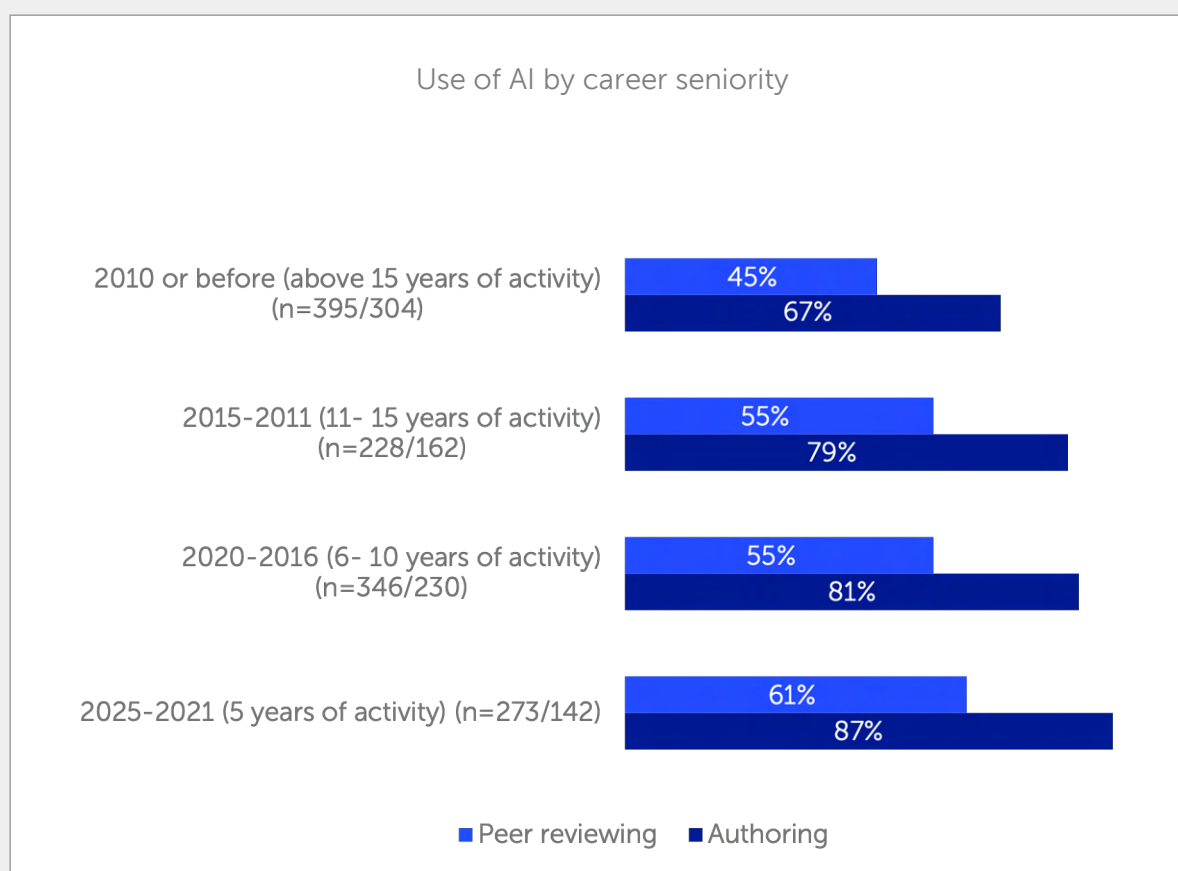


Figure 5: differences in AI use by seniority. We asked: 'How often do you use AI tools to help prepare and publish your articles, from manuscript drafting to journal publication?' and 'How often do you use AI tools when peer reviewing articles?' The graph shows the percentage of respondents in each group who indicated that they use AI to some extent for these tasks.

These gaps reflect differences in exposure, confidence, and incentives rather than capability. Free text responses reveal that early-career researchers see AI as integral to skill-building, efficiency, and participation, while senior peers are more cautious – shaped by concerns about quality, ethics, and over-reliance.

Unlocking AI's full potential means supporting both groups: expanding structured training and governance to build trust among experienced researchers and ensuring responsible frameworks that guide enthusiastic adopters. True progress lies in combining innovation with assurance – empowering every generation to use AI with confidence and purpose.

Bridging the gap to impactful AI use in research

Unlocking AI's true potential means overcoming the barriers that still limit its confident, consistent, and responsible use.

Our findings point to three key gaps – in trust, training, and governance – that must be addressed to move from surface adoption to meaningful, system-wide integration.

The trust gap

Researchers are enthusiastic about AI's benefits but **uneasy about its boundaries**. **71%** are concerned that AI tools are being misused by researchers, and **45%** share the same concern about publishers, while **53%** have personally **observed what they believe to be AI misuse** by peers.

In this report, misuse refers primarily to unsafe practices that compromise accuracy, transparency, or ethical standards – for example, relying on AI-generated text or data without verification, using tools that fabricate references or results, or failing to disclose AI assistance in manuscripts. Importantly, what respondents labelled as 'misuse' often reflected poor or unsafe practices rather than intentional wrongdoing or misconduct, showing a gap in how these categories are defined and understood across the community.

AI misuse can be viewed as a spectrum, ranging from unintentional errors to deliberate intent to deceive, with different behavior undermining the integrity of peer review. Three stand out.

- Unchecked bias, which can arise from the data used to train AI systems
- The design of the tools themselves
- The way reviewers apply the tools

All of these can reproduce or amplify hidden assumptions; poor oversight, when human judgment is reduced or misplaced during AI-assisted evaluations; and deliberate manipulation, where individuals use AI to fabricate, distort, or deceive.

Ultimately, AI misuse and bad actors can never be eliminated; the solution is not to avoid or fear AI, but to ensure the systems around it are strong. Researchers require robust training, clear governance frameworks, and active accountability mechanisms at every stage of the research and publication process. Systems must support efficient investigation and trust assessment, with clear expectations for traceability and disclosure.



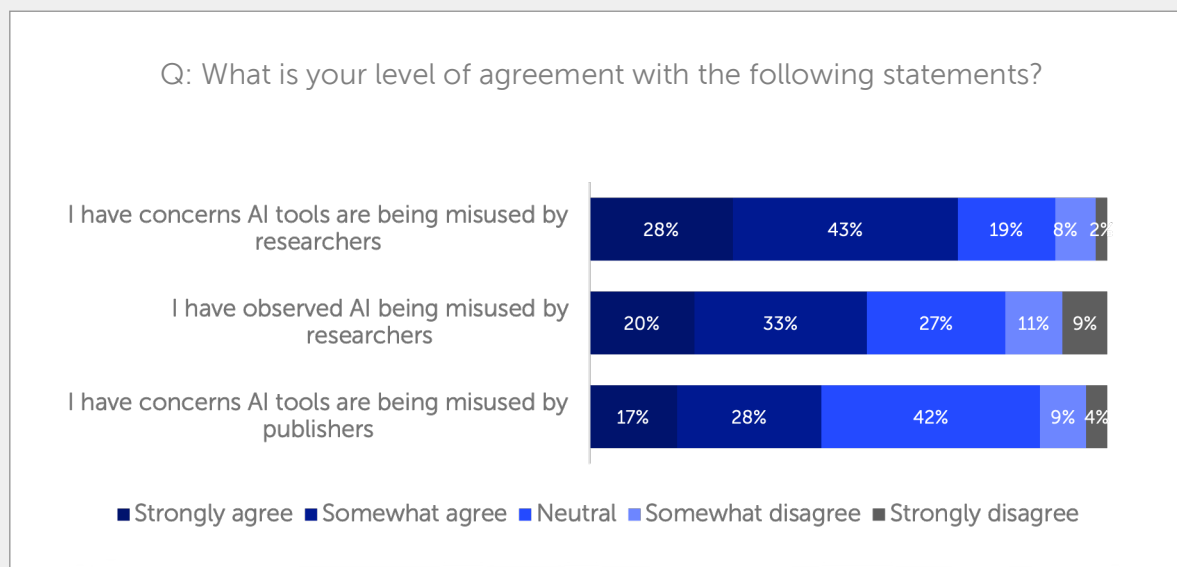


Figure 6: concerns about AI usage. We asked respondents about their level of agreement with three statements: I have concerns AI tools are currently being misused by researchers (n=1,332), I have observed AI being misused by researchers (n=1,232) and I have concerns AI tools are currently being misused by publishers (n=1,215).

These dynamics influence not only how AI is used, but how its use is perceived — particularly when researchers evaluate manuscripts supported by AI. Researchers are positive about the potential of AI and see effectiveness in practice, but many remain uncertain about whether to **trust** content supported by AI.

When asked how AI use by authors influences their perception of manuscripts, researchers expressed mixed feelings. Most recognize improvements in quality (63%), yet many say AI use makes them question integrity (52%), or that it introduces errors (48%).

Only a minority report higher confidence in authors' skills or professionalism, revealing an ongoing tension between quality and credibility.

“

These tools help me save time, improve clarity, and increase confidence when writing in English. However, I remain cautious about factual accuracy and always double-check scientific content.

—
Professor
Biosciences
Chile



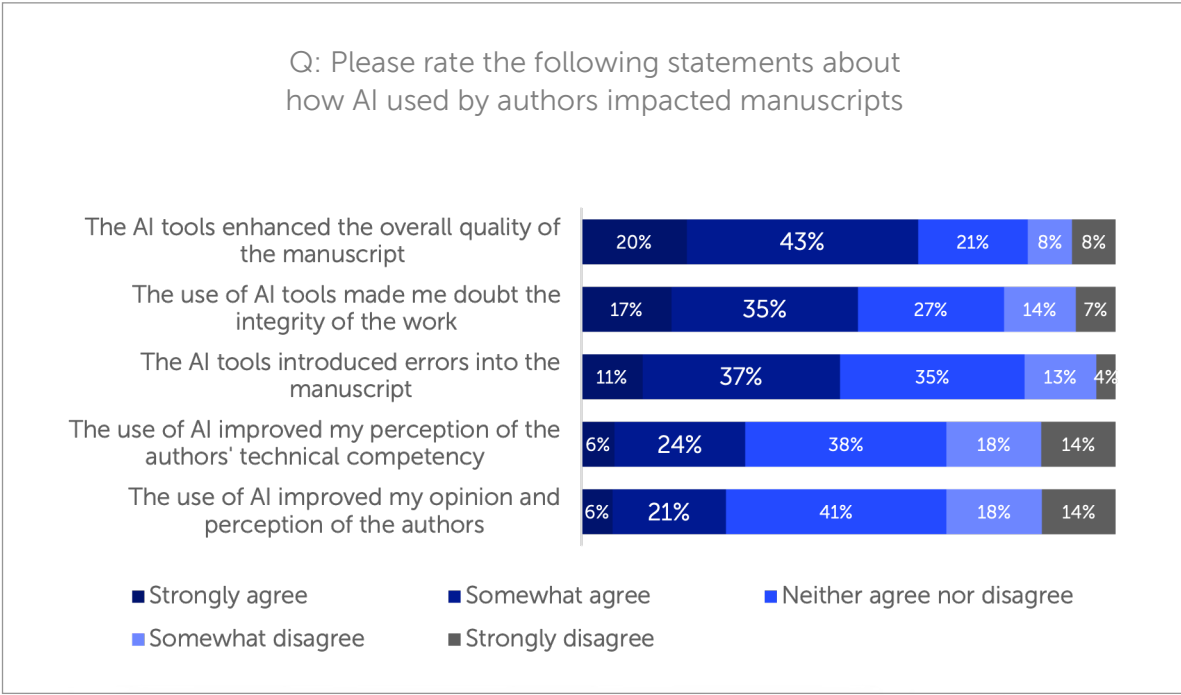


Figure 7: perceptions of how AI influences perceptions of an article. We asked respondents to rate their level of agreement with five statements about how AI used by authors impacted the manuscripts (n=711).

21%
increased
trust

A similar pattern is reflected in researchers' perceptions of AI use by publishers, who increasingly use AI tools in integrity pattern recognition, and to support with peer review efficiency. Although 66% of researchers rate publisher use of AI as effective in speeding up publication, **only 21% say AI increases their trust** when used in the publishing process.

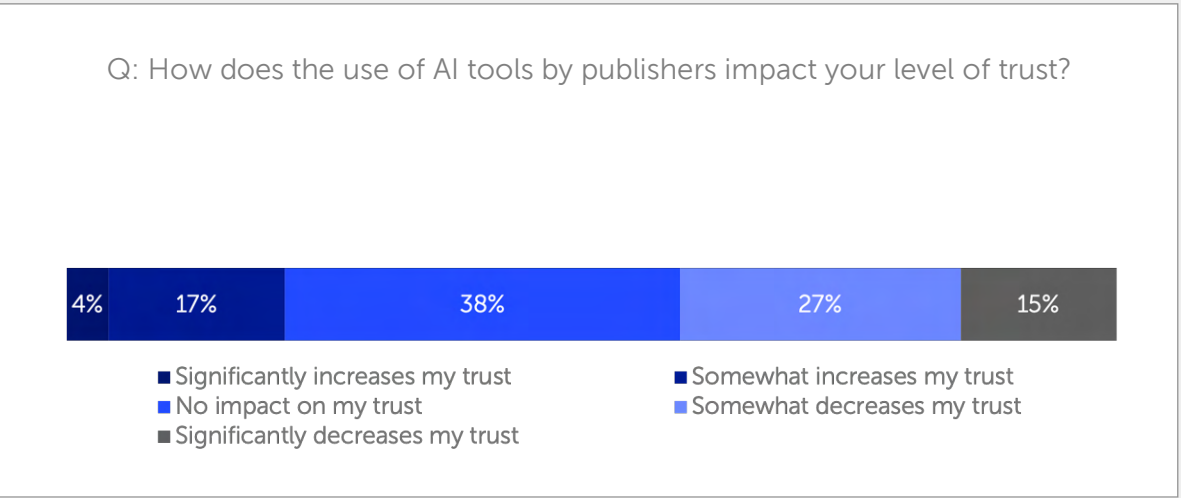


Figure 8: Trust in publishers is affected by their use of AI. We asked: how does the use of AI tools by publishers impact your level of trust in the publication process? (n=1,181)

A possible driver for this trust gap is that transparency remains low: **76% feel unaware or unsure if they have encountered a publisher using AI** during the publication process. Without disclosure, even well-intentioned use can appear opaque or risky.

The lesson is simple but profound: trust follows transparency. AI strengthens science and enhances peer review but is only fully effective when its presence is visible, accountable, and guided by clear standards.

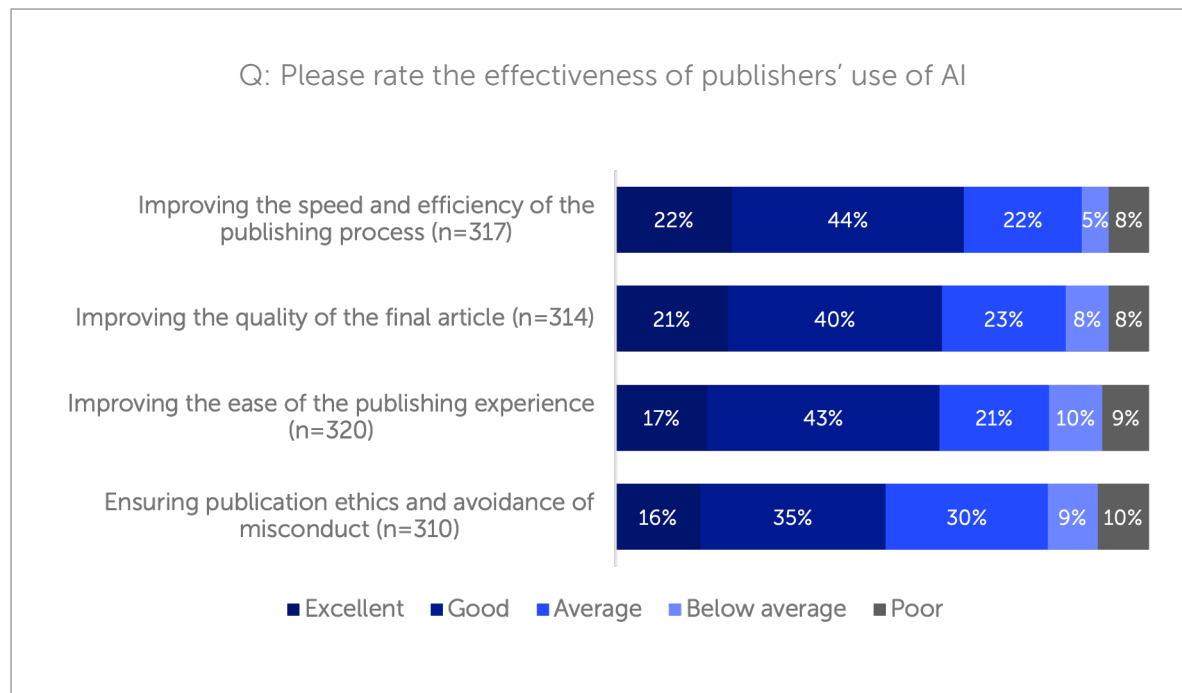


Figure 9: How well are publishers using AI? We asked: in general, how would you rate the current effectiveness of publisher use of AI on the following factors?



The training gap

AI literacy has become a dividing line in research, and our data shows a clear **training and support deficit**.

- 35% of researchers are entirely self-taught
- 31% rely on institutional guidance, while only 16% rely on publishers
- **18% take no action at all** to ensure best practice.

Researchers' caution around AI's capabilities can be partly attributed to this training gap; knowing how to use AI tools effectively and mitigate risks is an essential part of harnessing AI.

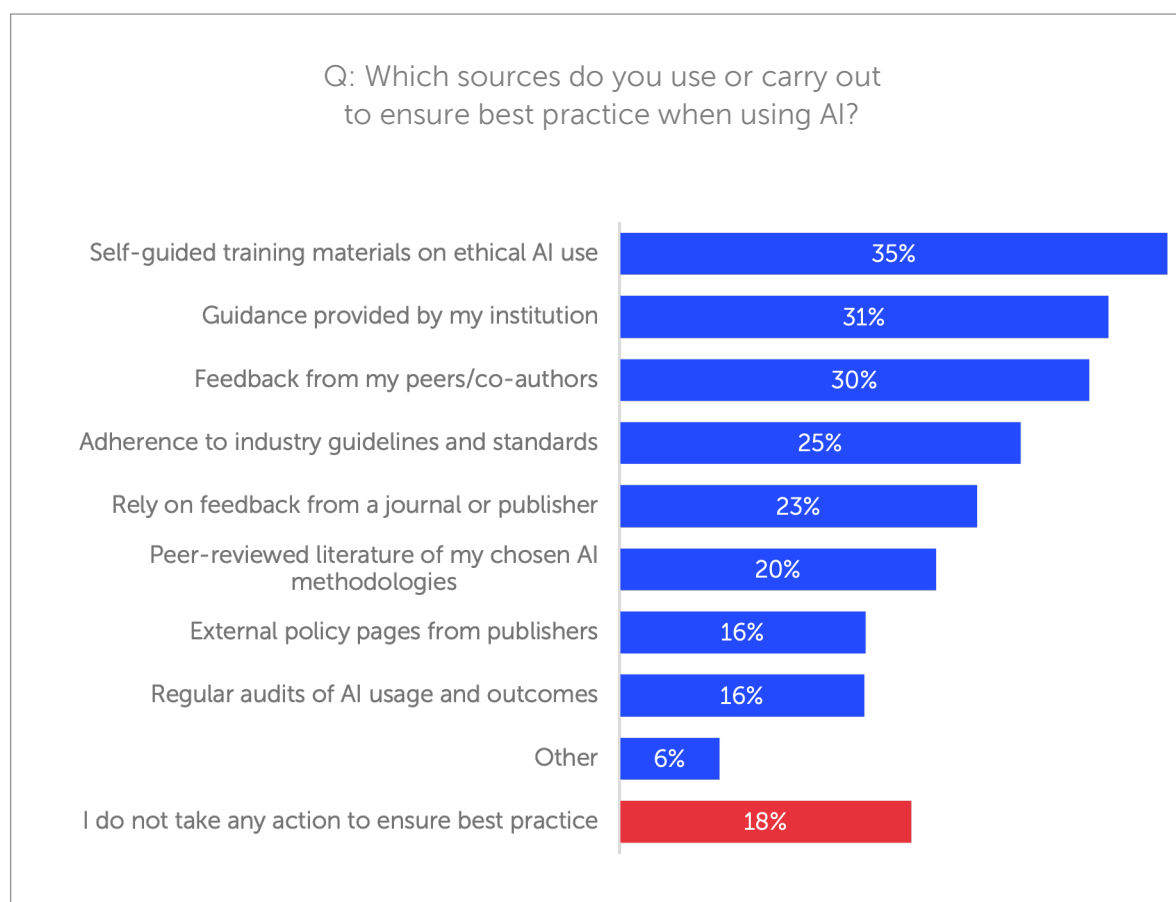


Figure 10: Where do researchers learn about AI? We asked: which, if any, of the following do you use or carry out to ensure best practice when using AI? (n=1,384). Respondents could select more than one response.

Artificial intelligence is not a single technology but a network of models and systems that interact in complex ways and differ in purpose, transparency, and risk. Effective usage depends on understanding each system's function, scope, and potential impact, and taking a holistic approach to adoption. A lack of training, and therefore a lack of understanding of AI's full and extensive potential, may contribute to the hesitancy and uneven adoption we see.

For example, free text comments in our research reveal skepticism on AI's ability to grasp complexity: "AI does not have the capability to carry the expertise and nuance of a peer review." The skepticism is justified: AI cannot replicate the depth of human expertise.

But with the right prompts and human oversight, AI can in fact support human creativity and complex decision making by providing important contextual information and engaging in structured reasoning that complements human judgment.

“

The idea that AI can't handle complex work often comes from using older or limited models. Over the past year, this has changed a lot – each new generation can understand more, think better, and self-correct. So, it's not only about prompting or keeping a human in the loop, but also about knowing which models are available today and choosing the right one for the job.

—
Lukasz Urzedowski
Head of Software Engineering, Frontiers

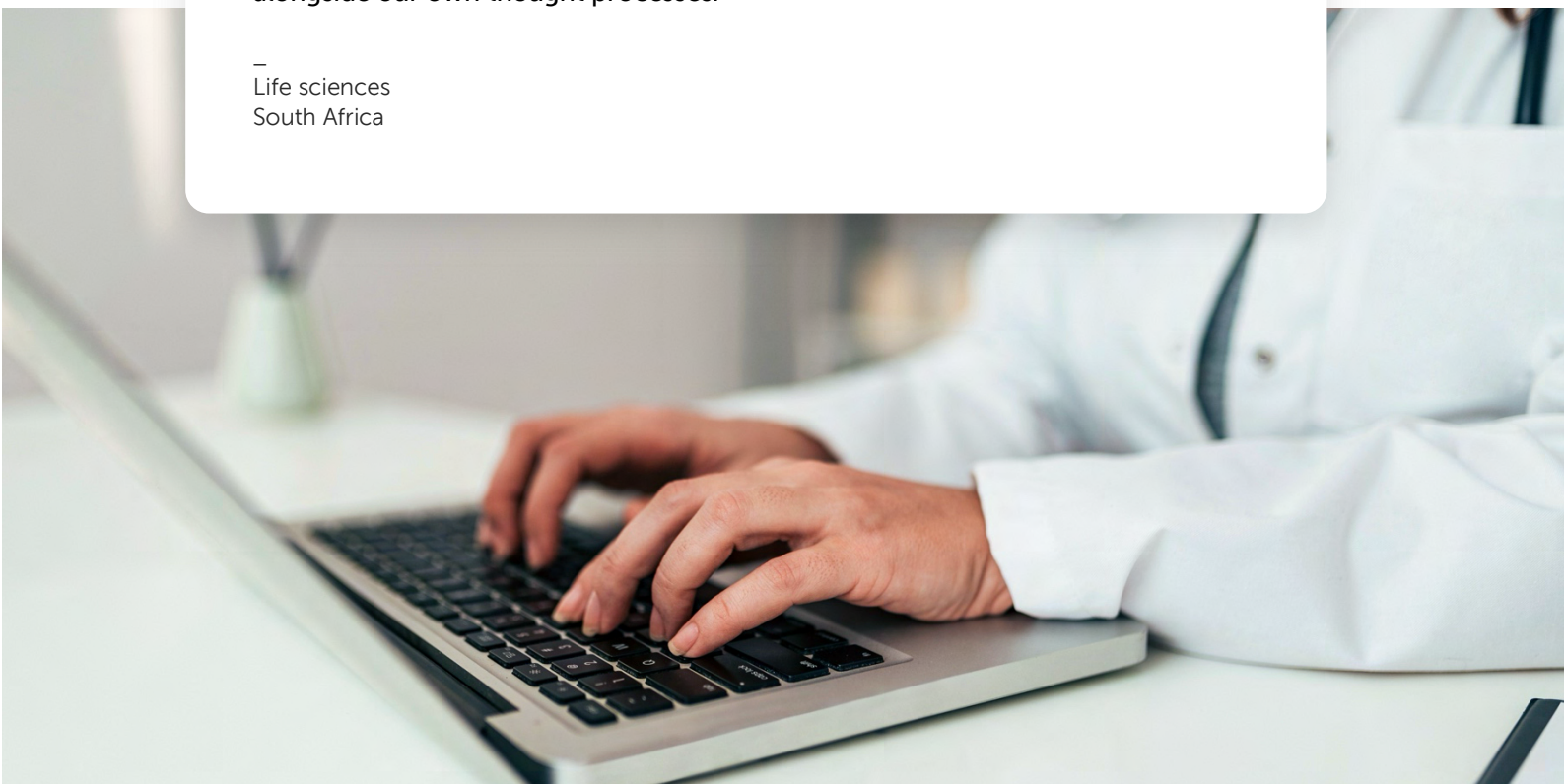
AI can also support with helping researchers explore alternative framings, interrogate methods, surface overlooked details, or test the internal logic of arguments more efficiently – **as long as they remain anchored in human judgement and disciplinary expertise.**

This suggests that effective use of AI is not about replacing human judgment but about training researchers to prompt, guide, and critically interpret AI outputs, transforming the technology from a mechanical assistant into a collaborative tool that enhances human creativity in research.

“

AI is a tool that we should embrace, whether it is peer reviewing or writing. A 21st century skill that we should teach our learners how to use responsibly, alongside our own thought processes.

—
Life sciences
South Africa



Interestingly, despite hesitations and anxieties around limitations and misuse, few researchers dedicate time to understanding best practice or accessing formal training, highlighting a need for incentives and governance in AI literacy. Early career researchers report the highest adoption rates but often rely on trial and error, while senior researchers are more likely to have taken no structured action to ensure best practice (22% vs 15%).

The result is a community that is both cautious and underprepared; eager to use AI responsibly but lacking the clear guidance to do so confidently.

This gap has created a fragmented learning ecosystem: a mix of self-training, peer advice, and informal experimentation, without consistent frameworks or shared standards. To move from apprehension to assurance, institutions, policymakers and publishers must take the lead by providing credible, discipline-sensitive training, and establishing clear guardrails that empower researchers to use AI with both confidence and integrity. Educators, meanwhile, can sustain AI literacy through ongoing programs and incentives.

The policy and governance gap

Researchers are increasingly using AI in both manuscript preparation and peer review, but formal governance, policy guidance, and support for its responsible use still lag behind. This is evident in the limited number of researchers who could identify useful tools or resources when asked, and in their low reliance on institutions, governing bodies or publishers for guidance.

According to the free text responses in our survey, **20%** of free-text responses named a **lack of governance or unclear rules** as the top barrier to them adopting and using AI tools responsibly.

This gap leaves authors and reviewers navigating powerful new tools without consistent rules. There is great opportunity for policy and governance to increase AI innovation for scientific progress, by providing confirmation and reassurance that they are doing so responsibly.

In some cases, policies are actively deterring exploration of AI to its true potential, with one author pointing out: "I would consider it unethical to use AI in peer reviewing manuscripts. Indeed, it wouldn't have occurred to me that doing so was even possible, save that the last time I did a review, the form told me not to use AI."

Ultimately, research integrity begins with researchers and is shaped by the policies and culture of their institutions and national systems. Publishers can only safeguard what is visible in the outputs they receive. Meaningful and sustained integrity is built on researchers' responsible use of AI, driven by robust institutional guidance and accountability.

The role of the publisher then becomes that of an influential catalyst. Researchers naturally adapt to the standards of the journals they aspire to publish in, and when those standards are applied consistently, they shape everyday research practice. Positioned at the intersection of innovation and integrity, they are uniquely placed to unlock AI's potential to transform peer review and editorial decision-making by empowering editors and reviewers to use AI confidently and creatively.

What's next? **Actions to unlock AI's full potential**

Our findings reveal that while researchers increasingly recognize AI's potential to improve efficiency and quality, confidence in its responsible use remains fragile. Concerns about misuse, unclear governance and limited training may be holding back progress.

Harnessing AI in an advanced and transformative way beyond surface-level writing assistance is an essential need for scientific progress. With structured governance, comprehensive training, and a foundation of trust, the scientific community can keep pace with technological change and harness AI to strengthen rigor, reproducibility, and discovery itself. And it's not enough to set guidelines and governance: good AI usage must be normalized, expected and rewarded within research for its full potential to be realized.

To unlock AI's full potential in research and peer review, the community must translate insight into coordinated, measurable action. The following stakeholder-specific recommendations are grounded in the survey's key findings and will close the gaps in trust, training, and governance identified across the global research ecosystem.





For educators and research institutions

Research institutions educate and train the researcher workforce, provide guidance on ethical standards and norms and instill research integrity. It is within their walls that research is conducted, and the final outcomes written up into research articles. It is therefore primarily the research institutions' task to educate and train their workforce on the opportunities and challenges that the AI revolution holds, establishing clear guidelines for the many potential opportunities present across the entire research cycle, from hypothesis generation and experimentation through to manuscript writing. Institutions that fail to act risk falling behind peers that proactively equip their researchers to use AI responsibly and effectively.

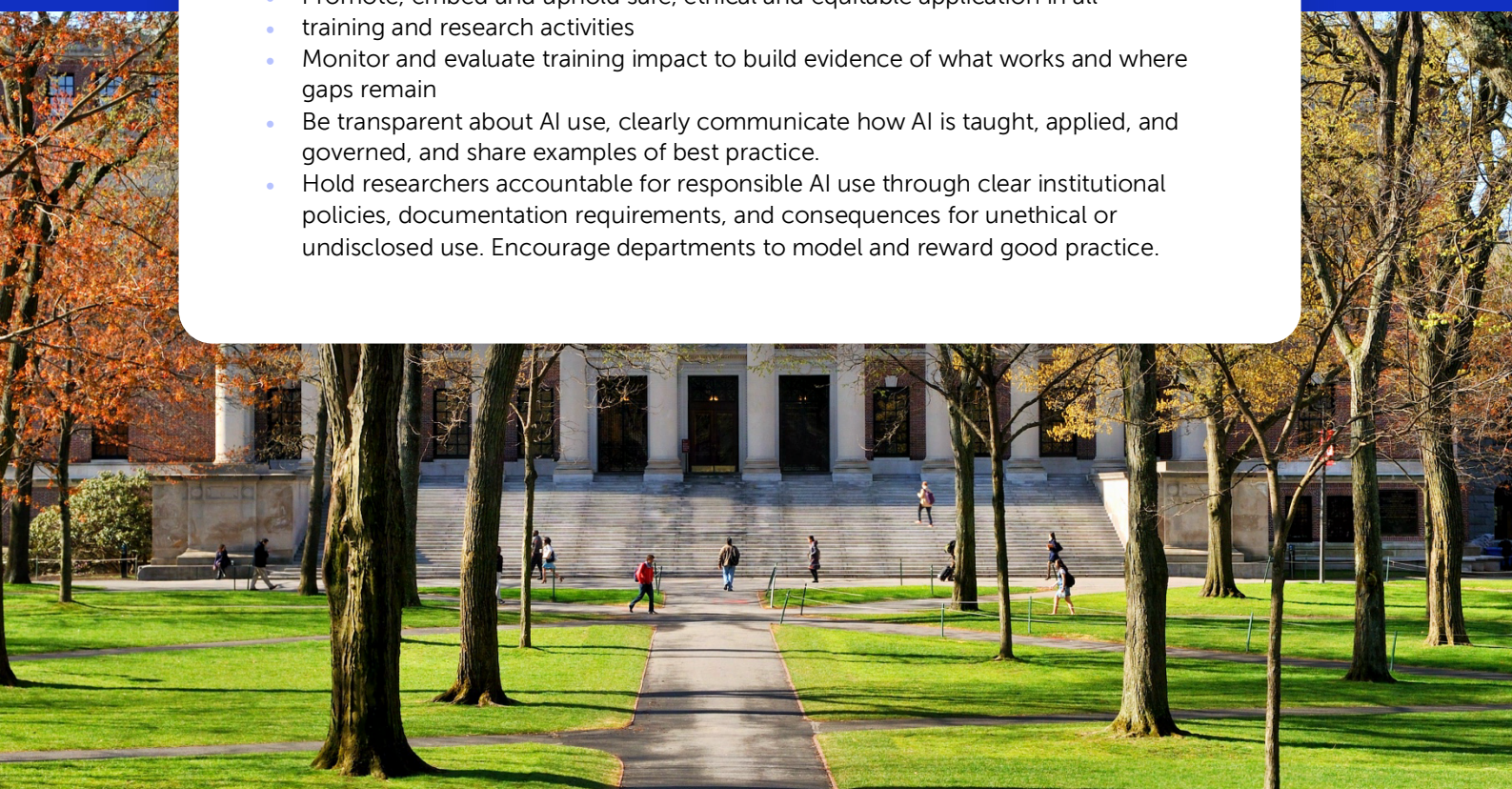
Our survey found that **35%** of researchers are currently entirely self-taught in AI, and **31%** seek guidance from their institution to ensure best practice, exposing a critical need for formal education and institutional preparedness.

AI tools can support learning directly, by providing real-time guidance, examples, and feedback that help researchers explore and refine their use of the technology. Simply prompting the tool for guidance on effective use can provide a valuable starting point

However, AI literacy goes beyond experimentation and discovery. Achieving AI literacy requires dedicated teaching and support, as it remains a barrier for many researchers. This education should equip researchers to create their AI prompts with intent, critically verify and validate AI-generated outputs, and understand the ethical and methodological implications of AI use within their specific research context.

Calls to action for education and training bodies

- Integrate AI literacy and governance principles into core research curricula
- Develop certified training frameworks
- Promote, embed and uphold safe, ethical and equitable application in all training and research activities
- Monitor and evaluate training impact to build evidence of what works and where gaps remain
- Be transparent about AI use, clearly communicate how AI is taught, applied, and governed, and share examples of best practice.
- Hold researchers accountable for responsible AI use through clear institutional policies, documentation requirements, and consequences for unethical or undisclosed use. Encourage departments to model and reward good practice.





For funders and policy makers

By embedding responsible AI use in **integrity frameworks, assessment systems, and grant mechanisms**, policy makers and funders create a complete ecosystem where responsible AI use isn't optional but rewarded, expected, and auditable. These best practices will enhance efficiency and deliver improved return on investment for the research they fund.

Calls to action for funders and policy makers

- Mandate transparency by requiring disclosure of how AI tools are used in funded research, peer review, and decision-making processes
- Mandate AI literacy and competency training
- Strengthen data provenance and certification systems to ensure datasets and models are traceable and verifiable
- Secure data integrity and storage by supporting shared infrastructure and trusted repositories
- Fund and incentivize responsible innovation
- Establish mechanisms to track compliance, measure impact, and harmonize standards across funders, institutions, and publishers.
- Ensure accountability for AI use by embedding disclosure and audit requirements into funding and assessment frameworks. Funded researchers should be responsible for demonstrating ethical and transparent AI practices throughout their projects.



For tool developers and providers

AI governance cannot be complete without accountability from those who design, train, and distribute the tools themselves. Publishers, funders, policy makers and end-users cannot meaningfully evaluate or regulate AI when its inner workings are opaque.

Calls to action for tool developers and providers

- Explain how tools work and what their limitations are
- Enable independent audit and interoperability
- Implement ethical and safety guardrails
- Maintain living transparency.



For publishers

Publishers occupy a unique position in the AI transformation. They sit at the end of the research cycle, and are responsible for controlling the evaluation, certification and quality of research articles, the final output of years of research work performed by researchers at institutions. The responsible adoption of AI will improve each of these functions and allow publishers to attain a new level of validation for the research that enters the scientific record.

Publishers therefore play a central role in guiding the responsible and innovative use of AI, ensuring that AI strengthens, rather than undermines, research quality and integrity.

Yet our findings show clear gaps that publishers are uniquely positioned to close. Trust in publisher-deployed AI remains low, most researchers receive no formal guidance from journals despite 23% of researchers looking to publishers to provide it, and governance frameworks are lagging behind adoption.

Calls to action for publishers

- Disclose and document all publisher AI use externally
- Establish ethical oversight standards in line with industry standards, including developing new safeguards to prevent misuse of AI
- Co-develop AI literacy and integrity programs and resources with editors and reviewers
- Monitor and report effectiveness of AI policies
- Contribute to collaboration efforts for standards alignment across the publishing industry
- Advocate for increased governance from institutions, funders and policy makers. for demonstrating ethical and transparent AI practices throughout their projects.

Frontiers' framework for responsible AI governance

This report goes beyond sharing survey data. It serves as the next phase of our commitment to unlocking AI's untapped potential in peer review.

As part of this effort, we are developing a **living guide for researchers** on the responsible and innovative use of AI. Currently in its community engagement phase, the guide invites feedback on our first draft to assess its clarity, usefulness, and real-world effectiveness. More than a set of rules, it aims to provide grounded, practical advice to help researchers use AI with confidence and creativity. The insights gathered through this process will shape the next iteration and ensure it truly meets the needs of the research community.

We also share the principles that guide Frontiers' approach to responsible AI. **Shaped by our hands-on experience developing and deploying AI tools and aligned with leading international frameworks** – including the OECD, UNESCO, NIST, ISO, and EU AI standards – these pillars translate global principles into a sector-specific framework for research and publishing.

By bringing these broad global standards down into a research and publishing context, **Frontiers' six AI pillars** make them more practical and usable for stakeholders across the scholarly ecosystem. Developed primarily to support **institutions and researchers**, the pillars also acknowledge the vital role of all research and **publishing stakeholders** – including editors, reviewers, and publishers – whose standards and practices help ensure that responsible AI use is embedded throughout scholarly communication.



1. Transparency and accountability

- Disclose when, where and how AI is used across workflows, from initial screening to production.
- Publish regular transparency reports that detail AI-supported processes and invite community feedback.

2. AI literacy and capacity building in research

- Invest in building AI literacy across institutions, research groups, and editorial teams.
- Move beyond self-teaching toward structured training and certified programs that equip researchers, administrators, and reviewers to use AI responsibly and critically.
- Champion critical prompting, verification, bias detection, and transparent AI use as emerging scholarly competencies.

3. Ethics and integrity guardrails

- Set clear standards for AI deployment across research assessment and editorial decision-making.
- Require human accountability for all AI-assisted outcomes, bias testing of AI tools, and reproducibility audits to safeguard research integrity.

4. Equity and access governance

- Embed fairness in every layer of AI adoption.
- Ensure equitable access to AI capabilities across disciplines, regions, and institutions, reducing systemic bias and supporting linguistic and cultural inclusivity in research.

5. Community engagement and researcher feedback

- Engage researchers, editor, and institutions in co-creating and refining AI policies.
- Establish transparent feedback mechanisms to detect challenges early and adjust frameworks responsively.

6. Advocacy and policy leadership

- Promote responsible AI governance across research and publishing.
- Use evidence from audits and impact assessments to inform global policy and standards.
- Share outcomes transparently to strengthen trust and accountability.

Frontiers' framework for responsible AI governance

1 Transparency and accountability

Ensure full visibility into when, where and how AI is used.



1

2 Training and capacity building

Develop structured education to build internal expertise in AI.



2

3 Ethics and integrity guardrails

Set clear standards for AI deployment.



3

4 Equity and access governance

Embed fairness in every layer of AI adoption.



4

5 Community engagement and feedback loops

Engage the scientific community in refining policies.



5

6 Monitoring, audit and policy leadership

Promote responsible AI governance across research and publishing.



6

Conclusion: an urgent call to action **in the age of AI**

The use of AI in academic publishing has reached a tipping point.

Nowhere is this more apparent than in the dissemination and validation of scientific research, where we must address an emerging 'AI divide': the widening gaps between organizations, authors, and readers who do not yet fully understand or benefit from advanced AI tools, and those who do.

The most effective path forward in closing this divide is not hesitation but rapid, responsible integration of AI across all aspects of scientific publishing.

Publishers now bear a duty to guide the research community beyond partial or superficial uses of AI. They must provide access to core AI capabilities within their platforms and equip the community with the support needed to use them responsibly.

The goal is to move decisively through this transitional phase of fragmented adoption and arrive at a mature, normalized use of AI that strengthens the integrity, accessibility, and global impact of scientific research. Policy for AI in scientific publishing must proactively reflect this new reality.

Frontiers will lead by example: offering trusted, secure AI tools; supporting researchers to use them responsibly; enforcing clear AI policies; and upholding our pillars of AI use to advance practices that strengthen the quality and impact of scientific review.

AI will define the next era of scientific publishing. The opportunity now is to harness its untapped potential to elevate scientific quality, reduce inequity, and accelerate scientific progress worldwide. The responsibility – for publishers, institutions, and policymakers alike – is to act with clarity, ambition, and urgency.

The moment calls not for caution, but for leadership.



Elena Vicario

Director of Research Integrity
Frontiers



Appendix: methodology

Our survey included **1,645 active researchers**, with responses collected between May and June 2025. The survey was sent out via email, and we ensured geographical and subject-matter expertise representation.

Eligibility required that participants had authored (n=1,565), peer reviewed (n=1,018) or acted as an editor (n=248) at least once in the 12 months before contact. Roles are not mutually exclusive; some respondents may have held multiple roles and therefore counts by role therefore sum to more than the total sample size.

We incentivized responses by offering those who completed the survey entry to a prize draw for one of five \$75 USD gift cards.

All participation was voluntary, and responses were anonymized before analysis. Data quality controls were also put in place to remove duplicate responses and automated responses.

Respondent demographics

Subject discipline: respondents self-identified their primary area of expertise from eight options. The most common were Health and Biomedical Sciences (27%), Physical Sciences and Engineering (20%), Humanities and Social Sciences (17%), and Life Sciences (11%).

Geography: responses were grouped into the following regions: Europe 27%, Asia 24%, North America 21%, Americas 8%, Africa 7%, China 6%, APAC 4%, and Other 2%.

Seniority: based on years since first publication, respondents were grouped into four categories: 0–5 years (22%), 6–10 years (28%), 11–15 years (18%), and 16+ years (32%).

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About Frontiers

Frontiers is one of the world's largest and most impactful research publishers, dedicated to making peer-reviewed, quality-certified science openly accessible. Our mission is to enable better collaboration and faster innovation so that scientists can deliver solutions for healthy lives on a healthy planet.

With more than three million researchers across 222 community-led journals covering 1,700 academic disciplines, we provide researchers with a trusted, cutting-edge, AI-powered open science platform to rigorously review their findings and maximize the dissemination of their discoveries.

As an open access pioneer, we actively drive the global transition to open science, working with researchers, universities, educators, policymakers, and businesses. In line with our mission to accelerate scientific solutions for a healthier planet, our initiatives include the Frontiers Planet Prize, which recognizes and rewards breakthrough research that supports efforts to stabilize Earth's ecosystems, and Frontiers for Young Minds, a journal that engages children in the peer review process, inspiring the next generation of researchers.