



Human-in-the-Loop for AI:

A Collaborative Future
in Research Workflows

Artificial intelligence is pushing the boundaries of research, making workflows faster and more effective. Enticed by its ability to automate processes, analyze data, and generate insights, growing numbers of organizations are adopting the technology. The healthcare and life sciences sector, in particular, is **leading the way in AI adoption and maturity** compared to other fields.

As companies hurry to embrace AI, it's crucial to take a measured approach. Artificial intelligence can create output at lightning speed, but it's human involvement that ensures reliable results. That's why a collaborative, human-in-the-loop (HITL) approach is emerging as a best practice. HITL ensures expert oversight of AI to align findings with research goals, maintain data integrity, and generate results in a safe, unbiased, and ethical way.

This paper explores how a HITL framework can help life science companies combine AI efficiency and human insight in research workflows. Discover key areas where AI can streamline processes while research teams guide algorithms, mitigate biases, and assure data quality. By incorporating a balanced approach, companies can lay the groundwork for accelerated breakthroughs in drug discovery, disease identification, and health outcomes.

What is the Human-in-the-Loop Approach in AI?

Human-in-the-loop systems integrate human oversight into processes involving artificial intelligence and machine learning. These approaches bring the critical thinking ability of humans and the speed and efficiency of AI systems together. HITL differs from fully autonomous AI systems, such as chatbots, robots, and self-driving cars. Fully autonomous models use AI to perform tasks and decision-making without human intervention.

Human-in-the-loop approaches recognize that AI models have limitations — **23% of AI adopters** at large global companies evaluate AI output daily, and 31% review the output weekly. Nearly one-quarter of companies had to rethink or override an AI system because of unreliable results, according to the research, which was spearheaded by SAS, Accenture Applied Intelligence, and Intel with Forbes Insight.

“With HITL, you’re asking AI to go on the journey with you. You’re working with it to come to a conclusion, and you involve your own thinking. In doing so, you can see and influence the path an AI takes to reach information. This makes it a very natural thing because you interact using conversational language.”
said Robert McGrath,
CEO of ReadCube.

AI as a Tool, Not a Replacement

AI’s computational abilities make it an incredibly powerful tool for researchers, but it’s not a substitute for the human creativity and thought that can drive breakthroughs. Jacqueline Ng Lane, assistant professor at Harvard Business School, **conducted research into how AI handled problems** requiring diverse expertise and perspectives.

The study found that AI is most useful as a collaborative tool, where humans continually work with the technology and refine insights. “We still need to put our minds toward being forward-looking and envisioning new things as we are guiding the outputs of AI to create the best solutions,” Lane said.

In a HITL framework, **AI complements human judgment and ingenuity**. It serves as an engine that helps humans work faster and more accurately. Scientists apply intellectual rigor to ensure findings

are aligned with objectives, recalibrating as needed if a project starts to veer off course. “With a HITL approach, AI is enhancing the work you already do,” McGrath noted. “It can enrich and optimize it, ultimately maximizing your efficiency as a researcher.”

How Human-in-the-Loop Can Address Research Challenges in Life Sciences

The life sciences sector is growing rapidly, fueled by the potential of transformative discoveries. The **number of life science researchers** in the United States grew 87% between 2002 and 2022. This increase is boosting the sector’s capacity to identify diseases, develop novel drugs, and improve patient outcomes.

However, progress is often incremental because of the resources needed to navigate vast amounts of information, maintain data integrity, and achieve regulatory compliance. AI accelerates laborious tasks such as scientific literature review and complex data processing. “Raising the productivity of research may be the most valuable of all the uses of AI,” the OECD stated in its report, **Artificial Intelligence In Science**.

Data from artificial intelligence is only meaningful if it’s contextualized. In a sector that has a far-reaching impact on lives, HITL provides crucial context and builds transparency and trust. **Scientists are essential for providing domain expertise** to align AI outcomes with industry best practices and account for real-world scenarios and novel or edge cases.

Managing Large Volumes of Data

Life scientists build on existing knowledge, evaluating and synthesizing diverse evidence to pursue their own research questions. They draw data from various sources, including published studies, patient records, and clinical trials. Literature review becomes increasingly expensive and time-consuming as available data grows. Between 2012 and 2022, the number of published science and engineering articles **increased nearly 60%**.

A human-in-the-loop approach streamlines data management. This can have a significant impact, especially considering a systematic literature review alone can take **between 6 months and 2 years**. AI can save significant time and resources by automating the discovery of relevant publications, screening large data sets, and condensing information. Humans safeguard the process by assessing data for quality and consistency. They can review study design, implementation, and reporting, and confirm findings.

Mitigating Bias And Ethical Concerns

As organizations entrust more workflows to AI, experts are **identifying areas of concern** that a human in the loop can help manage. This doesn't mean artificial intelligence creates **ethical issues and biases**, but as technology accelerates the speed of research, it can amplify problems.

For example, the accuracy or completeness of AI output depends on the data it's trained on. Data sets that are skewed toward or exclude a particular group result in biased outcomes. Privacy and transparency issues are also of concern, as it can be difficult to track data provenance.

A HITL framework can smooth these obstacles by ensuring scientists ask critical questions at key stages of the workflow. Researchers can check for vulnerabilities and ensure data is diverse, representative, and reflective of the population. They can also clarify tools and processes, monitor usage of sensitive data, and audit AI models to ensure accountability.

Why Life Science Researchers Should Adopt a Human-in-the-Loop Approach

Life science research is challenging to execute, demanding significant time, resources, and precision. Artificial intelligence is an ideal partner for **optimizing processes and advancing discovery**. It has broad applications and can support diverse methodologies, including systematic reviews, data modeling, laboratory and experimental research, and observational studies.

When AI is applied strategically with human guidance, it translates into significant benefits for life science researchers, including:

- Accelerated workflows, as AI completes routine and time-intensive tasks more quickly.
- Scaled capabilities, as AI processes massive volumes of data.

With resource-intensive tasks delegated to AI, research teams can devote more time to innovative work. "Generative AI is becoming the virtual knowledge worker," **said Ben Ellencweig**, a senior partner with McKinsey & Company. "[It has] the ability to connect different data points, summarize and synthesize insights in seconds, allowing us to focus on more high-value add tasks."

Streamline Workflows and Save Time

In one study exploring the impact of artificial intelligence on knowledge-intensive tasks, **AI improved the productivity of highly skilled workers** by nearly 40%. Organizations can leverage the technology at key stages of life science research to:

- Discover relevant studies and articles
- Compile data from multiple platforms
- Categorize and organize data
- Extract and synthesize information
- Process data and identify patterns and trends
- Enhance understanding through queries using natural language processing
- Manage citations and references for regulatory compliance
- Optimize patient enrollment for clinical trials

A human in the loop ensures due diligence to validate outcomes. Compared to other machine learning approaches, **HITL provides the most accurate results**. Continuous human feedback improves the quality of predictions, especially when data is biased or limited.

“For most generative AI insights, a human must interpret them to have impact,” **added Alex Singla**, global leader at QuantumBlack, AI by McKinsey. “The notion of a human in the loop is critical.”

Enable Strategic Research and Collaboration

With AI handling routine tasks, scientists can direct their energies toward higher value critical thinking. They have more time to evolve their research and formulate new questions.

HITL also offers an opportunity to collaborate across functions so teams with different areas of expertise can share insights and tackle problems. AI can facilitate workflow, synthesize information, and generate summaries. Natural language processing can make technical vocabulary easier to understand and more accessible.

A human-in-the-loop model also generates an exciting synergy that can **inspire novel thinking**. While humans might be constrained by their experiences and viewpoints, AI can challenge preconceptions and spark unexpected associations. It’s also useful as a sounding board for evaluating and refining ideas that lay the groundwork for innovation.



The Future of Human-in-the-Loop Systems in Life Sciences

Artificial intelligence is having a profound impact on the life science sector as companies work to discover new medicines, precisely diagnose diseases, and personalize treatment for individuals. It's estimated that AI-enabled workflows could **make it 40% faster** to bring a new molecule to the preclinical candidate stage. This efficiency could also generate **cost savings of up to 30%**.

Many life sciences companies are at the **early stage of AI integration**, but 86% of organizations currently using AI expect full integration within 2 years. These companies may see dramatic improvements in productivity.

The U.S. Food and Drug Administration (FDA) is seeing a rapid **rise in the number of submissions** using AI. Organizations are applying AI at all stages of drug development, including drug discovery, clinical research, safety surveillance, and manufacturing. As companies improve their research capabilities, scientists can better focus on high-impact, strategic endeavors.

For example, the FDA's Dr. Khair ElZarrad highlighted AI's critical role in modernizing clinical trials. A human-in-the-loop model can improve disparities in patient care by helping to expand the **reach and diversity of clinical trials**. AI can extract and organize real-world data from unstructured sources such as electronic health records, disease registries, and medical claims.

Using this information, scientists can improve understanding of patient sub-groups, determine participant selection criteria for trials, and improve recruitment to ensure more diverse representation.

The Collaborative Power of Researchers and AI

HITL workflows are accelerating scientific discovery, generating answers to complex questions faster than ever. As companies expand the body of scientific knowledge, they're bringing innovative products to market faster and improving patient outcomes globally.

At the heart of these achievements is a collaborative partnership fusing the power of AI and the ingenuity and judgment of human scientists and researchers. HITL ensures accurate, meaningful outcomes that are transparent and ethical and account for real-world scenarios and nuances.

To leverage this technology, organizations should review their workflows and identify stages where AI platforms can make a tangible impact. One option is ReadCube, a reference management software that uses AI to streamline time-consuming elements of literature management. ReadCube automates literature discovery and provides a single platform for searching, storing, organizing, and retrieving growing volumes of scientific literature. It integrates with existing systems and can be implemented quickly for immediate results.

"ReadCube has thought a lot about HITL," said ReadCube CEO Robert McGrath. "Our platform keeps humans in the loop every step of the way and lets them draw their own conclusions." Explore how human-in-the-loop AI can transform your research workflows.

Schedule a demo and learn more today.

