

# LIMS Feature

## Five Keys to Successful AI in the Lab

LabVantage Solutions

### The Execution Gap

Artificial intelligence (AI) and machine learning (ML) offer unparalleled opportunities to lab-centred companies. According to a McKinsey report [1], more than 25% of companies with proactive AI strategies attribute at least 5% of their top-line profits to AI. Revenue gains aside, AI can also create swift improvements in turnaround times, lab throughput, and labour costs.

Yet the majority of labs are missing out on AI's true potential. Labs are either hesitant to adopt the technology at all, or do so in a way that is doomed for failure. Gartner's findings [2] indicate that while nearly half of CIOs intend to implement AI, the failure rate could be as high as 85%, primarily due to biases in data, algorithms, or the teams overseeing them.

### Is AI fundamentally flawed? We don't think so.

Rather, the key to AI success - and, on the flip side, failure - is not in the technology but in the execution. LabVantage Solutions has developed a comprehensive five-step process for successfully integrating and profiting from AI within the lab and across the enterprise.

### Imagining the AI-driven 'Lab of the Future'

At LabVantage, we speak often of the 'lab of the future'. At its core, the future lab is one of end-to-end digital connectivity. Every piece of equipment is digitally linked, creating a "digital twin" of the lab in the virtual world. This virtual representation allows for predictive modelling, optimisation, automation, and, taking it a step further, automation - characterised by intelligent automation that allows human interaction or intervention in automated processes.

### Five Steps to Success with AI

#### 1. Give Your AI a Job

Select a well-defined use case. This will establish a clear purpose for your AI implementation, associating it with a measurable return on investment (ROI) and tangible business outcomes. Creating a use case enables you to allocate resources effectively and craft an action plan and roadmap. Labs that take an outcome-based approach to AI consistently achieve higher profit margins compared to those who merely dabble.

The most suitable case for your lab will align closely with your specific operations and reflect your ideal business outcomes. One common objective for labs venturing into AI is to leverage functions that yield outsized benefits with minimal effort or risk. Several functions fit this description, such as lab performance analysis, integrated modeling, and predictive formulas.

Rigorous AI-driven performance analysis, for example, allows labs to navigate operational intricacies quickly and easily, identifying problem areas affecting quality, turnaround time, or overall performance. Integrated modelling enables statistical modelling - such as calibration curves, immunogenicity, and stability - without the need to transfer data back and forth, preserving valuable information about the process. Lastly, AI can derive formulas from existing data to significantly reduce the number of physical studies required.

#### Effective cases might include:

- Instrument Data Analysis: Establishing a real-time data ingestion pipeline for laboratory instruments to enable downstream data analysis and predictive maintenance of instruments.
- Lab Resource Scheduling: Enhancing the efficient utilisation of lab resources (raw materials, equipment, and staffing) through operations research modelling.
- Quality Management: Employing statistical process control and quality-related analytics to identify drivers of poor quality and recommend real-time intervention strategies.
- PK-PD Modelling: Accelerating pharmacokinetic and toxicology studies through statistical tools and machine learning models, enabling researchers to conduct sophisticated analyses.
- Immunogenicity Analyses: Facilitating immunogenicity cut point analyses and calculations using parametric and non-parametric approaches through a set of out-of-the-box models.
- Formulation Studies: Utilising AI-based algorithms on existing data to predict a recipe that utilises specific raw materials and meets desired specifications.

#### 2. Solve Existing Data Problems

Data remains a significant obstacle for labs. Success with AI requires not just that you acquire the right data, but also that it is transformed into formats that are both useful and easily readable.

A substantial number of labs have yet to integrate their Laboratory Information Management Systems (LIMS), Electronic Lab Notebooks (ELNs), and other digital assets with their financial and production systems. To succeed with AI, data needs to flow seamlessly through a network that mirrors the inherent organisation of business systems. Recognising these connections and establishing an ecosystem to facilitate data flows are pivotal for success.

While many labs perceive their data challenges as technology-related, these issues often originate higher up in the organisational hierarchy. Companies must have a clear understanding of what is being measured and the defining parameters. Most importantly, they need a solid grasp of the metrics that hold significance.

Improving data quality begins with enhancing data stewardship and design. We recommend a project leader to oversee the organisation's effort at building its digital twin. This helps resolve any data-related challenges that arise and builds a data ontology that reflects the lab's real-world operations.

### 3. Find the Right Methods and Technologies

The world of artificial intelligence is complex and deeply technical. Successfully leveraging AI requires navigating this complex landscape and understanding the best technologies and techniques for your use cases.

We recommend collaborating with a knowledgeable partner who can guide you through the intricacies of relevant technologies, models, methodologies, and languages. Look for a partner with technical expertise in AI and analytics, complemented by a comprehensive understanding of your specific industry and workflows. A partner familiar with the distinctive instruments, processes, use cases, and - most importantly - business objectives in your industry can make all the difference to your lab's success with AI. The right partner can also ensure your data quality, privacy, and security protocols meet necessary standards.

### 4. Incorporate AI into Operational Processes

Identify the hotspots within your lab's workflow that would see the most benefit from the addition of AI. Explore avenues to seamlessly integrate AI models into your workflow by embedding them into existing software and tools or creating new, complementary interfaces. Additionally, prioritise optimising the human-machine interface by selecting platforms with user-friendly interfaces and dashboards.

### 5. Foster a Culture that Embraces AI

The real challenge is often not one of technology but of the humans operating it. There is significant cultural resistance to AI, even among scientific circles. This resistance looks a lot like the resistance we've seen with other technologies, including the computers, smartphones, and internet that we can seemingly no longer live without.

Concerns about AI potentially replacing human tasks in laboratories undoubtedly lead to apprehension in the workplace. Encourage an open, collaborative culture that educates employees about the opportunities presented by this technology and reassures them of their ongoing value in the workplace.

Integrating AI also requires a mindset shift on behalf of management and employees. Labs will reap the true benefits of AI only when they focus on upskilling teams and fostering a complementary relationship between software workers and human workers. And with AI taking care of routine tasks, team members can shift their focus to more strategic work.

## Ultimately, True Success Begins with Commitment

The companies that see real success with AI are committed from day one. While many laboratories are enticed by the promises of new technology, they often underestimate the dedication required to realise long-term benefits.

Labs that approach AI with a 'testing' mindset often end up not just abandoning AI, but in a worse position than when they started, having invested significant time and resources into an 'experiment' that didn't go as planned.

Rather than 'testing' out the technology with language like 'playing around with it' and 'building a prototype', we recommend fully committing, initially with small achievable use cases and building from there. Why? Approaching AI through an explorative lens rather than a commitment lens sets the stage for potential failure. Proficiency with AI demands a development mentality. Instead of merely 'playing around' with the technology, ask and answer:

- What does success look like?
- What's my plan for achieving this success?
- What resources will I need?
- How will I deploy this into production?
- How will this technology fit into my business plans and processes?
- How do I deploy this technology into production effectively?
- Can I find a partner with the right resources?

With the right mindset, a commitment to seeing it through, and an expert scientific data partner by your side, any lab can reap the enormous benefits of our century's defining technology.

## References

1. <https://www.mckinsey.com/capabilities/quantumblack/our-insights/global-survey-the-state-of-ai-in-2021>
2. <https://www.gartner.com/en/newsroom/press-releases/2018-02-13-gartner-says-nearly-half-of-cios-are-planning-to-deploy-artificial-intelligence>



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