

5 Ways to Improve Your Lab with LIMS in 2024

STRATEGY GUIDE



# 5 Ways to Improve Your Lab with LIMS in 2024

Implementing a state-of-the-art Laboratory Information Management System (LIMS) in 2024 can transform your lab's operational efficiency to a new level. By capitalizing on the latest technologies, an advanced LIMS can refine your lab operations by integrating cutting-edge capabilities that make your workflow more seamless than ever.

In this eBook, we will explore five strategies you can implement to amplify your lab's efficiency with LIMS in 2024. Whether you're managing a small research lab or overseeing a large-scale facility, these strategies will help streamline your processes, reduce manual errors, and save valuable time.

Five strategies to amplify your laboratory's efficiency with LIMS in 2024

### Implement an all-in-one LIMS solution

Laboratory Information Management Systems (LIMS) have undergone significant evolution since their inception. Traditionally, LIMS were primarily used to track samples, including their collection, processing, and storage, as well as to manage lab data.

However, as the pace of scientific research has increased and the complexity of lab workflows has grown, the demands on LIMS have expanded accordingly. Today's all-in-one LIMS platforms now offer a wide range of features and functionalities to meet these evolving needs, some of which include:



## Five strategies to amplify your laboratory's efficiency with LIMS in 2024:

## Integration with Lab Instruments and Software:

The consolidation of lab and business solutions such as Electronic Lab Notebooks (ELNs), Sample Data Management Systems (SDMS), Customer Relationship Management (CRM) systems, Quality Management Systems (QMS), Statistical Analysis Software (SAS), and enterprise resource planning (ERP) software, will streamline both lab functions and overall business processes.

### **Centralization of Data:**

One of the primary advantages of an all-in-one LIMS platform is its ability to centralize information management. It consolidates all lab-related records, including those for sample testing, quality assurance, and corporate processes, in a unified and safe repository. This aggregation of data fosters effective and easy exchange of information across the organization to facilitate teamwork and knowledge-based decision-making.

### Data Integrity and Compliance:

Centralizing data in a unified LIMS platform enhances data integrity and security. By eliminating disparate systems and manual data transfers, the risk of data loss or corruption is minimized. Adhering to regulatory mandates such as GLP, GMP, CLIA, and FDA 21 CFR Part 11 is critical. All-in-one LIMS solutions offer built-in features designed to help labs adhere to these demanding regulations.





## Choose pre-configured and industry-specific LIMS solutions

Opting for pre-configured LIMS solutions that are customized for specific industry demands allows you to leverage the deep insight and expertise of LIMS vendors who are well-versed in the unique challenges and needs of your lab. Aligning with these industry-specific requirements, these systems are designed with predefined workflows, templates, and built-in regulatory compliance capabilities to ensure that your implementation is streamlined and effective. This strategy significantly minimizes complexities and delays that are commonly associated with custom development, enabling you to get up and running quickly. The primary benefits include:

### Alignment with Industry Requirements:

Workflows tailored to meet the specific demand of your industry.

### Faster Implementation:

Predefined templates, workflows, and configurations that are ready to use.

### **Cost Savings:**

Faster deployment and improved productivity.

#### **Reduced Risk:**

End-to-end compliance management for regulatory standards.

### **Enhanced User Experience:**

Interfaces designed for the targeted industry are easy to navigate, aligned with best practices, and reduce the learning curve.

#### Life Cycle Management:

Pre-configured systems allow for ongoing support, maintenance, and updates to stay current with the latest features, bug fixes, and regulatory changes.

LIMS systems tailored for particular industries cater to the specific demands, operational procedures, and compliance rules inherent to sectors like pharmaceuticals, clinical diagnostics, food and beverage, petrochemicals, and environmental analysis. Fit-for-purpose systems enhance your operational efficiency and ensure compliance with pertinent regulatory standards.



## Easily adapt to changing needs with scalable cloud-based SaaS LIMS

A cloud-based Software-as-a-Service (SaaS) LIMS is a secure and cost-effective alternative to the traditional LIMS. This flexible licensing platform provides the ability to rapidly scale up or down based on the evolving needs of the lab. With the ability to seamlessly expand its capabilities, this system enables labs to effectively manage varying levels of workload without the burden of significant hardware purchases or the continual costs of system upkeep. Subscribing to a usage-based payment plan eliminates the need for hefty initial expenditures, making this an economical choice for labs of all sizes. Below are the key benefits of deploying a cloud-based SaaS LIMS:

### • Scalability to meet ever-changing business demands.

- **Cost-effective model** eliminates the need for expensive hardware setup and ongoing upkeep.
- Automatic updates to ensure access to the most recent functionalities and security measures.
- **Rapid deployment** using pre-configured workflows and templates.

- Anytime, anywhere access via the internet and mobile devices to enable remote work and collaboration.
- Increased Security and Data Backup using advanced encryption, secure access controls, and systemic backups to safeguard data integrity and security.
- Enhanced Regulatory Compliance supported by integrated capabilities like electronic signatures, audit trails, and data traceability to comply with industry standards.

The trend toward Cloud-based SaaS LIMS platforms is on the rise due to their scalability, flexibility, and cost-effectiveness. In 2024, more labs are expected to transition from on-premises systems to cloud-based SaaS LIMS to streamline their processes, reduce expenses, and maintain agility in a rapidly evolving digital landscape.



### Leverage AI for data-driven innovation

Artificial intelligence (AI) is a powerful emerging tool that can help companies innovate and is one of the fastest-growing trends reshaping industries in 2024. It is set to redefine the landscape of pharmaceutical R&D through its ability to integrate data-driven approaches and advanced analytics, thereby expediting the drug discovery process, refining clinical trial protocols, and enabling personalized medicine.

LIMS plays an essential role in the efficient aggregation and management of complex datasets derived from a wide array of lab equipment and various information streams. The integration of AI technology aids in uncovering patterns and trends that may be missed by traditional approaches, improving accuracy and productivity in R&D, and expediting the pace of scientific innovation that would not be possible without AI.

Artificial Intelligence serves as a powerful tool for analyzing data and developing predictive models within Life Science R&D. With the rise of generative AI, there is now a potential to create new insights by harnessing all accessible data. As a case in point, by combining AI with GenAI, researchers have the capability to engineer proteins with higher efficacy than naturally occurring counterparts for drug delivery applications. The table below summarizes how AI can be employed during the early phases of pharmaceutical development.

"By 2026, more than 80% of enterprises will have used generative AI APIs, models and/or deployed GenAI-enabled applications in production environments, up from less than 5% in 2023." - Gartner<sup>1</sup>



### How is AI being used in preclinical drug development?

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	Target Discovery and Validation	Drug Discovery and Screening	Lead Optimization	Preclinical Development
Objectives Al Can Support	Analysis of large data sets (omics, clinical data, scientific literature) to identify potential drug targets	Virtual Screening of large compound libraries to identify compounds that may bind target molecule.	Prediction of the pharmacokinetic properties of lead compounds.	Design and optimization of drug formulations to improve drug solubility, stability and bioavailability
Applied AI Technologies	<ul> <li>NLP</li> <li>Deep Learning</li> <li>Graph neural networks</li> </ul>	<ul> <li>Machine learning</li> <li>Generative models</li> <li>Graph convolutional networks</li> </ul>	<ul> <li>Machine learning</li> <li>Deep learning</li> <li>Generative models</li> </ul>	<ul> <li>Machine learning</li> <li>Deep learning</li> </ul>

Al-based computational approaches are disrupting conventional laboratory-based drug development and changing the competitive landscape for drug development organizations. Life science CIOs can use this research to accelerate their drug development processes and reduce associated costs.<sup>3</sup>

The strategic deployment of AI technologies is an essential cornerstone in building the Lab of the Future and enabling your lab to utilize the capabilities of your LIMS Source: Gartner (March 2023)<sup>2</sup>

to its fullest extent. However, it is essential to have a comprehensive strategic roadmap, a solid governance framework, and a robust risk management strategy. A team of experts with domain-specific expertise is vital for the successful integration and optimal utilization of AI within the lab in collaboration with your LIMS. Their expertise and practical knowledge can be tremendously beneficial in developing AI models and algorithms that accurately align with the specific needs of your lab.



## Reduce downtime in your lab with LIMS predictive maintenance

As LIMS is often used to manage lab equipment, integrating AI capabilities can substantially reduce downtime in your lab through predictive maintenance. By anticipating potential equipment failures and triggering proactive maintenance measures you can decrease the likelihood of interruptions to lab operations. Predictive maintenance uses data-driven insights to monitor and analyze the condition of equipment and uses algorithms to determine when maintenance should be performed, ensuring it's done only when necessary but before any failure occurs. It predicts when maintenance is needed based on real-time data.

#### Data collection through IoT devices:

IoT technology delivers continuous, real-time information about a range of aspects including operation, performance, environment, and other variables, offering a steady stream of data.

### ML provides predictive analytics:

ML algorithms analyze vast amounts of data, identify patterns or deviations, and adapt from past information provided to forecast potential instrumentation issues prior to malfunction.

### **Alerts and Notifications:**

Once AI/ML models have been integrated into the LIMS, they system can be configured to automatically send out alerts to the lab personnel, prompting them to carry out required maintenance tasks.

### Development of essential maintenance timetables:

Labs are able to establish precise schedules for performing maintenance tasks. This approach guarantees that maintenance is carried out when it is needed but before potential issues may occur.

Adopting preventive maintenance measures allows labs to take corrective action in advance, which helps reduce operational disruptions and lower expenses. The integration of LIMS with AI and ML capabilities enables labs to anticipate possible equipment breakdowns by recognizing early warning signs. This proactive approach to addressing issues sustains the smooth functioning of lab activities and prevents unexpected downtime.



### In Summary:

Labs looking to boost their operational productivity in 2024 should consider implementing a state-of-the-art LIMS. By capitalizing on the latest technologies, an advanced LIMS can transform lab operations by providing advanced features that streamline and refine workflows. For labs of all sizes, from small scientific labs to large-scale operations, the following five strategies can amplify efficiency through the use of LIMS:

- All-in-one LIMS platforms provide a centralized hub for the effective management and organization of samples, lab data, and instrumentation.
- Specialized LIMS solutions, tailored and adapted for particular industry needs, offer the most suitable option for labs with unique requirements and adhere to specific regulatory standards.
- Using flexible, scalable cloud-based SaaS options for LIMS enables labs to adjust easily to evolving business requirements.
- The adoption of AI fosters innovation driven by data, guaranteeing that lab procedures consistently remain at the forefront of tech progress.
- With AI, labs can expedite the drug discovery and development process through data analytics, ultimately leading to faster and more effective treatments.

 Integrating LIMS with AI-powered predictive maintenance tools reduces downtime and increases efficiency. Predictive maintenance helps to identify potential problems, allowing for proactive maintenance and optimizing the performance of lab instruments.

With the ever-evolving tech landscape, the integration of advanced LIMS and AI technology has proven to be the key to increasing lab productivity and efficiency. However, the successful deployment of these solutions requires a well-defined strategic blueprint, a robust governance structure, and a proactive risk management approach to ensure smooth implementation and utilization.

To achieve optimal results from Al-driven LIMS solutions, it is essential to engage a team of experts with domain-specific knowledge and hands-on experience. Expert LIMS teams can provide relevant insights into how best to implement Al alongside LIMS to ensure that the solutions are scalable, maintainable, and operate efficiently, with a tailored approach to meet unique requirements. As scientific R&D continues to evolve, LIMS technology is well-positioned to adapt and enhance its capabilities to address emerging challenges and opportunities.



### **References:**

<sup>1,3</sup> Chandrasekaran, A., "<u>Top Strategic Technology Trends for 2024: Democratized</u> <u>Generative AI</u>", Gartner, October 16, 2023.

<sup>2</sup> Harwood, R., Shanler, M., "<u>How is AI being used in Clinical Development</u>", Gartner, March 31, 2023.

### About Astrix

Astrix is the unrivaled market leader in creating & delivering innovative strategies, technology solutions, and people to the life science community. Through world-class people, process, and technology, Astrix works with clients to fundamentally improve business, scientific, and medical outcomes and the quality of life everywhere. Found-ed by scientists to solve the unique challenges of the life science community, Astrix offers a growing array of fully integrated services designed to deliver value to clients across their organizations. To learn the latest about how Astrix is transforming the way science-based businesses succeed today, visit <u>www.astrixinc.com</u>.



