

WHITE PAPER

BUILDING AN INTEGRATED DIGITAL LAB HOW A MODERN LIMS CONNECTS PEOPLE, PROCESSES AND DATA



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Executive summary

Laboratories are under increasing pressure to deliver faster results, manage growing volumes of complex data, and maintain strict compliance standards, all while operating within constrained resources. Many organisations have invested in digital tools, yet still struggle with fragmented systems, disconnected workflows, and limited visibility.

The concept of the integrated digital lab addresses these challenges by bringing together people, processes, and data into a unified, coordinated environment. At the centre of this transformation sits a modern Laboratory Information Management System (LIMS), providing the structure and connectivity required to operate at scale.



PEOPLE



PROCESSES



DATA

This paper explores how laboratories can move beyond isolated systems towards true integration, and how LIMS enables that shift.

The pressure on modern laboratories

The operating environment for laboratories has fundamentally changed. Expectations have increased, while complexity has multiplied.

Organisations are dealing with tighter budgets and stretched teams yet are expected to deliver results more quickly than ever. At the same time, the volume and variety of data being generated continues to expand, placing strain on legacy systems and manual processes. Regulatory scrutiny has intensified, requiring robust audit trails and data integrity. Many labs are also working across distributed teams, often relying on multiple instruments and systems that do not naturally communicate with one another.

These pressures expose a common issue: most labs are not lacking digital tools, but they are lacking integration.

From digitisation to integration

Laboratories have evolved significantly over time, but progress has not always been linear.

Early environments relied heavily on handwritten records, paper forms, and physical logbooks. These approaches were inherently prone to error, difficult to track, and time-consuming to manage. The introduction of digital tools improved efficiency, but often created new challenges. Spreadsheets, standalone databases, and isolated systems led to fragmented workflows, duplicated data, and limited oversight.

Today, leading laboratories are moving towards fully connected environments. In these settings, systems are integrated, workflows are configurable, and processes are increasingly automated. The result is greater scalability, improved traceability, and readiness for audit at any point.

However, many organisations remain in a transitional state, digitised, but not yet truly integrated.

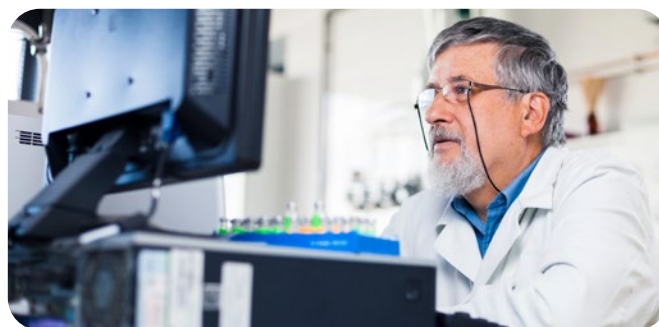


What defines an integrated digital lab

An integrated lab is not defined by the number of systems in place, but by how effectively they work together.

At its core, it is a strategy that ensures people, data, and processes are seamlessly connected. Information is accessible through a single, reliable source of truth. Processes are standardised and repeatable, yet flexible enough to adapt to changing requirements.

Collaboration is enabled across teams, supported by secure and controlled access to data.



It is equally important to clarify what integration is not. It is not simply linking systems together, nor is it about consolidating all data into a single repository. It is not a one-off IT initiative, and it does not aim to replace human expertise with automation. Instead, integration is about alignment, ensuring that every part of the laboratory ecosystem works cohesively.

THE THREE PILLARS OF INTEGRATION

Successful integration depends on balancing three core elements: people, processes, and data.



PEOPLE

People need access to the right information at the right time, presented in a way that is relevant to their role. Visibility across teams improves collaboration and reduces bottlenecks



PROCESSES

Processes must be clearly defined and consistently applied. Standardisation enables repeatability and reduces the risk of errors, while adaptability ensures the lab can respond to new requirements without disruption.



DATA

Data underpins everything. It must be accurate, secure, and traceable, with clear lineage and governance. Without this foundation, insight and compliance are compromised.

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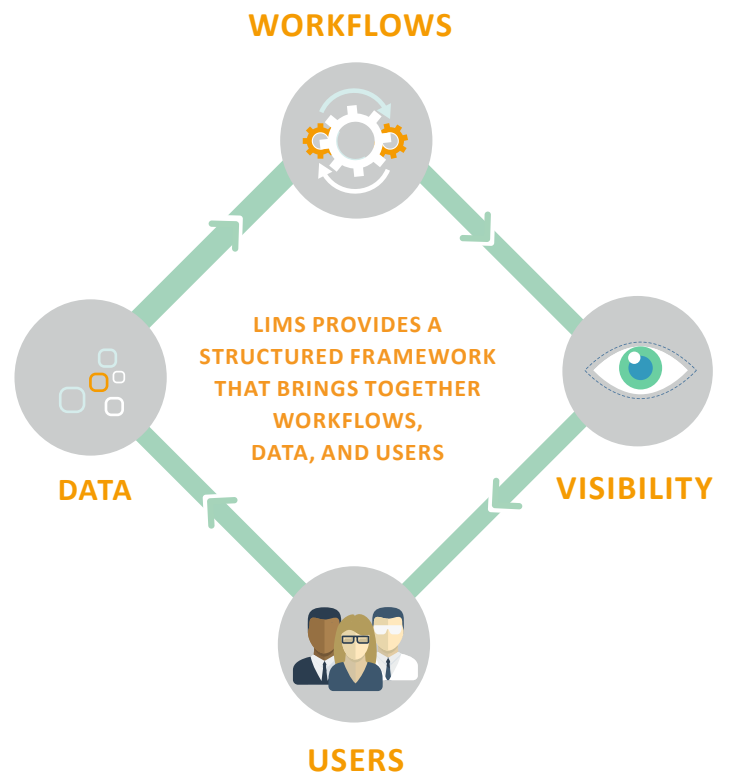
LIMS as the digital foundation

A modern LIMS plays a central role in enabling integration by acting as the operational backbone of the laboratory.

Rather than functioning as a standalone system, it provides a structured framework that brings together workflows, data, and users. Laboratory operations can be centralised, allowing for consistent process execution and complete visibility across activities.

At the same time, LIMS supports secure collaboration. Access to data can be controlled through role-based and attribute-based permissions, ensuring that users only see what is relevant to them. Integration with identity providers and the use of multi-factor authentication strengthen security, while encryption protects sensitive data both in storage and in transit.

In this way, LIMS enables organisations to scale operations without sacrificing control or compliance.



The value of LIMS extends beyond internal coordination. It acts as a hub, connecting the laboratory to the wider digital ecosystem.

Rather than creating another silo, LIMS breaks down barriers, enabling a continuous flow of information across the organisation.

Connecting the wider ecosystem

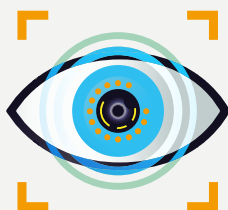
Through the use of APIs and connectors, LIMS can integrate with instruments, electronic lab notebooks, enterprise systems, and external data sources.

This ensures that data flows seamlessly between systems, reducing manual intervention and eliminating duplication.

Turning data into insight

One of the most significant benefits of integration is the ability to generate meaningful insight.

With a unified data foundation, laboratories can access real-time dashboards that provide visibility into operations, quality, and performance. Trends can be identified more easily, bottlenecks can be addressed proactively, and resources can be allocated more effectively.



Stakeholders, both internal and external, can access the information they need through secure portals, with data tailored to their specific roles. This not only improves decision-making but also strengthens transparency and trust.



Starting the journey

Moving towards an integrated digital lab requires a structured and considered approach.

PHASE 1 Strategic Foundation

Organisations typically begin by assessing their current state, identifying gaps in systems, processes, and data management. From there, attention turns to reviewing and optimising workflows, ensuring they are fit for purpose before introducing new technology.

Defining a clear future vision is essential, as is aligning that vision with broader organisational goals. Implementation is most effective when delivered in phases, allowing for incremental improvements and reduced risk.

Change management plays a critical role throughout. Early engagement with teams, clear communication, and ongoing support help ensure successful adoption and long-term value.

Assessment & Gap Identification



Workflow Optimisation



Vision Alignment



Phased Implementation



PHASE 2 Execution & Sustenance



Continuous Change Management

Technology as an enabler

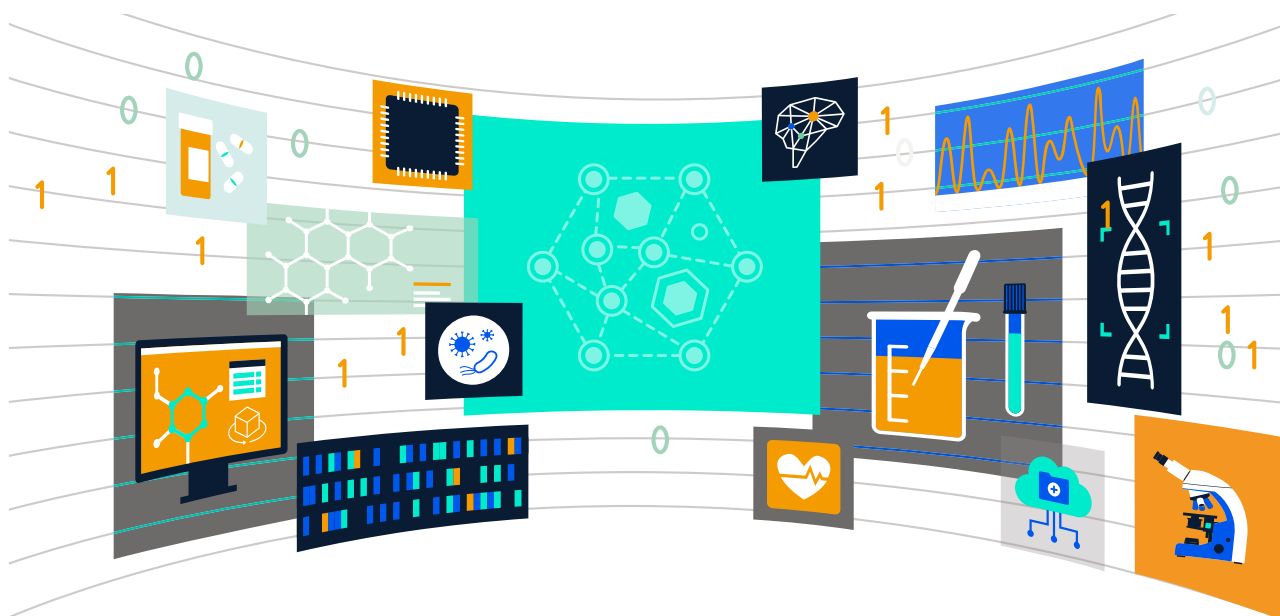
It is important to recognise that technology alone does not deliver integration.

Systems such as LIMS provide the tools and infrastructure, but success depends on how they are applied. When aligned with people and processes, technology becomes a powerful enabler of transformation. Without that alignment, it risks adding complexity rather than removing it.

Using Achiever LIMS, the University of Liverpool delivered a fully integrated, paperless solution for its longitudinal birth cohort study, Children Growing up in Liverpool (C-GULL) study, handling large-scale data from up to 10,000 families across multiple systems over a long period of time.

“I think the simplest way to explain it is that the project wouldn’t have been paperless without the support of Interactive Software and Achiever LIMS. Given the scale and complexity, it simply wouldn’t have been feasible without their system.”

Nicole Maziere, LIMS Manager at the University of Liverpool



CONCLUSION

The shift towards an integrated digital lab is no longer optional. As laboratories face increasing demands, the ability to connect people, processes, and data becomes essential.

A modern LIMS provides the foundation for this transformation, enabling organisations to move beyond fragmented systems towards a cohesive, scalable, and insight-driven environment. By adopting a strategic approach to integration, laboratories can improve efficiency, strengthen compliance, and accelerate innovation.

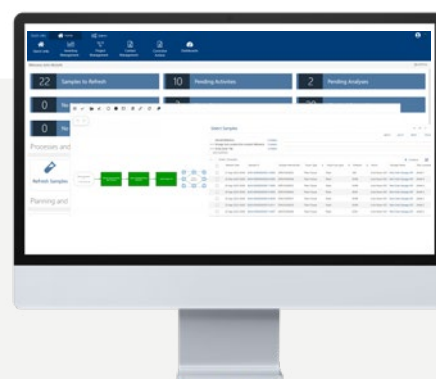
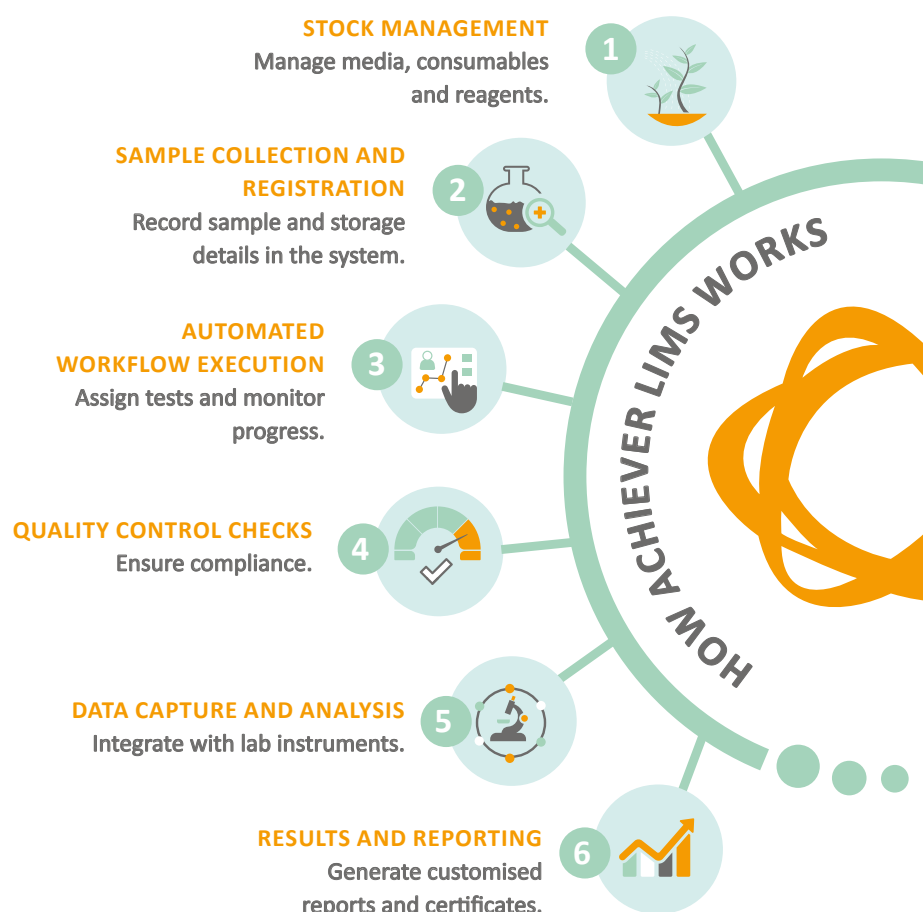
Interactive Software supports this journey by delivering flexible, secure LIMS solutions designed to meet the evolving needs of modern laboratories.

INTERACTIVE SOFTWARE

At Interactive Software, we specialise in delivering LIMS that empower laboratories to raise quality standards, ensure regulatory compliance, and embed best practices through streamlined, efficient workflows. With over two decades of experience, we have supported laboratories across a range of sectors, including pre-clinical and clinical research, academic institutions, Agritech, environmental science, and biorepositories, to implement successful, transformative software solutions.



Our flagship product, **Achiever LIMS**, is a powerful, web-based and highly configurable system designed to centralise laboratory data and manage the full lifecycle of samples. From collection to disposal, Achiever LIMS ensures complete sample traceability and delivers audit-ready evidence to meet stringent compliance and quality assurance requirements.



Achiever LIMS equips users with intuitive tools to record, search, and analyse data with ease. By simplifying data access and enhancing sample visibility, researchers can quickly locate the materials they need and ensure they are used effectively for their intended purpose.

Whether you're seeking to modernise legacy systems, improve data integrity, or maintain compliance in regulated environments, Achiever LIMS offers a robust, scalable solution tailored to your operational needs.

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Interactive
software
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