

2025



The Lab Automation Playbook

Everything you need to know before automating your lab.

FUJIFILM
FUJIFILM Biosciences

Scientific research is advancing rapidly, driven by cutting-edge technology and the increasing complexity of data. Laboratories face growing pressure to execute intricate protocols, handle large datasets, and comply with strict regulatory standards, often within short timeframes and limited resources. To meet these demands, many institutions are implementing automated systems. These solutions simplify workflows, reduce manual errors, and strengthen data integrity, allowing scientists to concentrate on innovation and discovery. This playbook explores the key benefits of laboratory automation as well as the most common automation pitfalls and how to avoid them.



How Automation Makes Your Lab Better

Enhanced Accuracy and Efficiency

Manual processes are time-consuming and prone to variability, compromising result accuracy and reliability. Automation replaces repetitive tasks with consistent, programmed workflows that improve repeatability and reduce human error. This capability is especially critical in complex tasks such as assay development, high-throughput screening, and clinical sample processing, where precision is essential.

Data Integrity and Compliance Assurance

Accurate recordkeeping and traceability are essential in regulated environments. Automation systems track every step, from barcode scans and reagent usage to equipment operation, ensuring full transparency and audit preparation. Adherence to industry standards like 21 CFR Part 11 gives laboratories confidence that their documentation meets regulatory requirements. Features like real-time logging, automated alerts, and integrated inventory management contribute to preserving data integrity and maintaining compliance.



Increased Flexibility for Changing Needs

The evolving nature of scientific research demands adaptable systems that keep pace with shifting priorities. Automated platforms provide this flexibility through multi-assay execution, real-time simulation, and customizable methods. Ideal platforms allow advanced users to develop in-house custom scripts or bespoke protocols tailored specifically to their workflows.

Resource Optimization and Reduced Costs

Automation enables laboratories to maximize equipment use and minimize waste. Intelligent scheduling and device sharing allow multiple assays to run simultaneously on a single platform, increasing throughput without additional hardware. Automated monitoring of consumables prevents shortages and overstocking, improving inventory management. Also, by reducing human errors, automation avoids repeating unnecessary experiments, saving reagents and staff time. These efficiencies translate into cost savings and help teams allocate budgets strategically to support ongoing innovation.

Remote Access and Collaborative Workflows

Modern research often involves teams working across multiple sites or hybrid arrangements, making remote system access essential. Web-based automation tools allow staff to monitor ongoing experiments, adjust protocols, and simulate future workflows from any device or location. This accessibility enhances collaboration, improves decision-making, and reduces downtime. These advantages are especially valuable for academic consortia, hospital laboratories, and multidisciplinary projects.



Why Your Lab Automation Might Fail (and How To Prevent It)

Transitioning a laboratory from manual to automatic workflows can present several challenges. Recognizing and addressing these potential challenges can ensure a smooth and successful implementation. By understanding the common pitfalls and preparing effective strategies to overcome them, laboratories can fully leverage the benefits of automation.



Integration Challenges

Integrating new systems with existing equipment and workflows can often lead to disruptions, inefficiencies, and increased costs due to incompatibility. For instance, if a new system cannot communicate with existing legacy instruments, it may cause data silos and workflow disruptions.

Solution:

Choose a lab automation software offering broad compatibility with various instruments and systems. Ensure that it supports open standards and provides robust APIs for seamless integration.

Staff Resistance To Change

Choose a lab automation software offering broad compatibility with various instruments and systems. Ensure that it supports open standards and provides robust APIs for seamless integration.

Solution:

Foster a culture of innovation and open communication. Involve employees in the transition process, emphasizing the benefits of automation. Demonstrate how it can enhance their roles, reduce workloads, and offer opportunities for skill development.

Inadequate Training

Even the most advanced automation systems are only as effective as the personnel operating them. Inadequate training can lead to misuse, errors, and underutilization of the technology.

Solution:

Invest in a lab automation software provider that offers comprehensive training programs, including interactive modules and personalized training sessions. This maximizes the benefits of the automation system and improves overall efficiency.

Poor Data Management Systems

Automated systems generate large volumes of data, which can be challenging to manage. Poor data management can lead to inaccuracies, loss of data integrity, and security vulnerabilities. For example, laboratories may struggle to meet regulatory compliance without secure data storage and tracking.





Solution:

Implement automation software with robust data management features such as secure data storage, real-time tracking, and comprehensive audit trails.

Underestimating Maintenance Needs

Regular maintenance is essential for automated systems to function optimally. Neglecting maintenance can lead to system failures, downtime, and costly repairs.

Solution:

Collaborate with the software provider to develop a proactive maintenance schedule. Regularly update the software, perform routine checks, and promptly address any issues to ensure reliable operations and extend the equipment's lifespan.

Overlooking Scalability

As laboratories expand and their needs evolve, a system that meets current demands may become insufficient as task volume and complexity increase.

Solution:

Choose a scalable automation solution that supports easy expansion and customization, handling increased workloads and new features without major changes.

How To Seamlessly Integrate Automation In Your Lab

Shifting from manual to automated workflows requires careful evaluation of how the transition will impact key variables. For example, manual pipetting offers direct control over reagent exposure times, while liquid handling systems may introduce tubing that can affect reagent stability. Additionally, automated systems may expose reagents for extended periods, potentially reducing their efficacy. As a result, protocols must be adjusted to accommodate these changes.

Incubation is another critical factor. Traditional incubators enable direct plate handling, while robotic systems have varied lid removal times, influencing evaporation rates and assay performance. Testing and refining parameters like lid timing and environmental control settings are essential to ensure consistency.

1

Adapt and Optimize Protocols

- Adjust reagent exposure times to account for extended handling durations.
- Optimize lid removal timing to reduce evaporation during incubation cycles.
- Calibrate liquid handling systems to ensure precise and accurate reagent delivery.

2

Calibrate and Monitor the Environment

- Continuously track temperature and humidity levels within automated enclosures to ensure stable conditions.
- Use pre-conditioned reagents to minimize variability caused by environmental factors.
- Align incubator settings as closely as possible with manual conditions to ensure reproducible results.

3

Test Hybrid Workflows

- Run parallel manual and automated workflows before full implementation.
- Identify discrepancies and refine processes based on test results.
- Compare assay results to validate automation performance against manual benchmarks.

4

Standardize Equipment Workflows

- Use identical pipettes, reagents, and consumables across both setups to reduce variability.
- Ensure consistent workflows by standardizing equipment and procedures.

5

Implement Modular, Scalable Solutions

- Introduce automation gradually with high-throughput steps to minimize workflow disruption.
- Implement in phases, focusing initially on processes that will provide the greatest efficiency gains.
- Design systems to be scalable, allowing easier troubleshooting and incremental improvements as automation progresses.



How To Engage and Train Your Staff

While automation software can offer significant benefits, its full potential can only be realized with an appropriately trained team. Comprehensive training is essential for seamless integration, allowing staff to embrace new technologies confidently.

By implementing a robust and targeted training plan, laboratories can ensure their staff are equipped to maximize the software's features. A well-structured training approach will accelerate the learning curve, empowering teams to confidently adapt to the new system and ultimately, drive greater operational efficiency.

1. Tailor Training To Specific Roles

Not everyone will use automation tools in the same way. Tailoring training to specific roles and responsibilities of each team member ensures they acquire the skills most relevant to their tasks. For example, managers may need advanced training on reporting and analytics, while technicians focus on day-to-day workflows.

2. Emphasize the Benefits and Features

Staff should understand the full scope of the automation system they will be using. Start by introducing the core features and functionalities of the software, highlighting how these aspects will improve laboratory operations. Focus on the benefits, such as reducing manual work, improving data accuracy, and streamlining scheduling processes.



3. Hands-On Experience

The most effective way for staff to learn how to use automation systems is through hands-on experience. This allows them to directly interact with it and understand how it integrates into daily workflows. Offering controlled simulations or trial runs enables staff to gain practical experience without the pressure of live operations.



4. Provide Continuous Education and Support

Ongoing support ensures laboratory personnel remain proficient in operating a new automation system. This can include access to user manuals, video tutorials, and a dedicated helpdesk for troubleshooting. Periodically assess proficiency through hands-on assessments to ensure staff remain informed about evolving features.

5. Encourage Open Communication and Feedback

Fostering a culture of open communication and encouraging feedback is essential for maximizing staff performance with automation systems. Regular surveys, one-on-one meetings, or team discussions can be used to collect feedback from staff on their software experience.

Why Choose a Customizable Lab Integration Software

Customizable software puts you in charge of your business processes, setting your organization up for growth and success in a rapidly changing industry. Let's explore how this approach can revolutionize your operations.

Lab Integration Software With Open API

A unique web interface and open API's enables you to customize the user interface to fit your organization's needs. This allows you to fine-tune your automation systems and integrate them seamlessly with your existing workflows and in house LIMS system. Whether you need to adjust parameters for a specific project or streamline data collection for a particular client, this flexibility ensures that your processes remain as efficient as possible.

Optimized User Interfaces

For contract research organizations (CROs) and other specialized industries, custom user interfaces (UIs) can each be tailored to match the expertise and preferences of your team. Expanding the range of users who can operate your system eliminates the need to rely on highly trained experts for daily tasks.

Reduced Human Error

Customizing your UIs to suit your needs minimizes the risk of human error. This added control improves efficiency, allowing your team to focus on high-priority tasks and strategic decisions. Streamlined workflows lead to smoother, more reliable operations overall.



Project-Specific Customization

With custom UIs, you can design distinct interfaces for each project or client. This level of customization enables you to tailor the lab automation software to the specific needs of individual projects, enhancing efficiency and fostering smooth client collaboration. Additionally, it simplifies the replication of successful processes across projects, ensuring consistency throughout.

Reduced Human Error

Customizing your UIs to suit your needs minimizes the risk of human error. This added control improves efficiency, allowing your team to focus on high-priority tasks and strategic decisions. Streamlined workflows lead to smoother, more reliable operations overall.



Real-Time Monitoring and Insights

Open software enables real-time access to data and metrics for all your processes so that you can track key performance indicators. With this feature, you can immediately identify areas that need improvement and respond appropriately to emerging challenges, ensuring your operations remain efficient and optimized.

Enhanced Collaboration and Communication

Customizable integration software enhances communication and collaboration across departments by providing centralized access to key data and resources. This seamless information sharing empowers teams to work together more efficiently, driving productivity and fostering a cohesive work environment.

In conclusion, opting for customizable integration software enables unmatched innovation and streamlined efficiency in your laboratory. Step away from the constraints of generic systems and take control of your automation and integration processes.

Should You Automate Your Lab?

Before investing in automation tools, conducting a cost-benefit analysis (CBA) is crucial to understanding the financial impact. This process compares the costs of automation with the expected benefits. Start by defining the project's scope and identify all associated costs such as equipment, installation, maintenance, and staff training. Then quantify the benefits including labor cost savings, error reduction, increased throughput, and improved efficiency. Evaluate the ROI by comparing the net benefits to the total investment. It's also important to consider any risks or potential challenges and incorporate strategies to manage and mitigate them.

We can help you calculate your ROI.



Director™ Lab Scheduling Software

Director™ is a purpose-built platform designed to streamline operations, minimize manual input, and ensure robust data integrity. Developed by Wako Automation to meet the demands of today's dynamic research landscape, the software prioritizes adaptability, reliability, and comprehensive traceability. Powered by a modern web-based architecture, it enables teams to manage workflows with precision and ease.

Key features include:

Actionable Insights

Leverage visual analytics to identify bottlenecks, track instrument utilization, and enhance overall performance.

Advanced Control

Monitor live runs, receive smart error alerts, and optimize workflows with delayed starts and logical sequencing.

Remote Access

Monitor and control lab activities from any device with a browser, including desktops, tablets, and smartphones.

Customization Capabilities

Use the Director SDK to develop and deploy unlimited custom drivers and methods tailored to your unique needs.

Real-Time Flexibility

Edit methods during active runs and support multiple concurrent assays, with instruments functioning even offline.

Compliance & Traceability

Automatically log every action for full traceability, with built-in 21 CFR Part 11 compliance and no add-ons required.

Intuitive Interface

Design and customize multi-step protocols with a user-friendly interface that simplifies setup time and reduces errors.



BOOK A DEMO TODAY



www.wakoautomation.com/contact-us



FUJIFILM Wako Chemicals U.S.A. Corporation
Automation Division
5405 Morehouse Drive, Ste 110
San Diego, CA 92121



(858) 222-8904



wkusautomation@fujifilm.com

FUJIFILM
FUJIFILM Biosciences



director

