Managing complexity in laboratory automation

Introduction

The increasing demand for laboratory testing, coupled with a persistent shortage of medical laboratory professionals, necessitates workflow evaluation and productivity improvements. In histopathology, automation plays a critical role in enhancing efficiency, turnaround time (TAT) and accuracy through standardisation. Automation also enhances output quality by significantly reducing errors associated with manual tasks and streamlining non-value-added activities, such as loading and unloading samples from instruments. However, transitioning from manual workflows to automation comes with challenges, including complex workflow integration, human touchpoints and change management hurdles.

To address these challenges, laboratories require a structured partnership to successfully implement and consolidate operations while optimising workflows. Once financial approval is granted for new instruments, laboratories often have only a few months to integrate solutions into routine operations. Ideally, an implementation period between 8-12 months allows for a smoother transition, but due to project complexity and resource constraints, laboratory managers frequently struggle to oversee the process alongside their daily responsibilities.

Without dedicated personnel, successful implementation is difficult to achieve. While training, follow-ups and troubleshooting support are vital, they are insufficient to manage the complexity of an automation projects. In these cases, a dedicated Implementation Consultant (IC) enables laboratory staff to support the project while maintaining focus on daily operations, ensuring seamless integration and adherence to project timelines.

In combination with effective leadership and access to subject matter experts, the IC plays a pivotal role in reducing project delays, promote cohesiveness between members of the team and enhance communication around project milestones and timelines.

The challenges facing histology labs

As histology laboratories strive to meet increasing demands and maintain high-quality standards, they encounter several hurdles that can hinder efficiency and productivity. These challenges arise from outdated manual processes, resource constraints and the complexity of integrating automation.

Addressing these issues is crucial to ensuring a seamless transition to more advanced and effective laboratory workflows. The most common challenges include:

- Scalability limitations: Manual processes restrict the ability to scale operations without increasing staff.
- Error-prone workflows: Human decision-making stages introduce variability and potential for mistakes.
- Bottlenecks in production: Workflow inefficiencies slow down operations and reduce overall productivity.
- Process complexity: Reducing unnecessary steps is crucial to enhancing efficiency and safety.
- Balancing automation and expertise: Histology remains both an art and a science, requiring careful integration of automation without compromising quality.

Getting buy-in from staff

Ensuring laboratory staff engagement is critical to successful implementation. When staff members feel included in the decision-making process, they are more likely to embrace change. Without their support, implementation efforts may face resistance and ultimately fail.

Consistent and clear communication should be a priority throughout the project lifecycle, ensuring that all staff and project members feel like active participants rather than passive recipients of change. Engaging staff effectively includes regular meetings with the project sponsor and team members to discuss milestones, next steps and quick wins. Celebrating achievements, addressing concerns and easing resistance are all crucial elements in driving change.

Even after installation and staff training, seamless system integration may take time - often a few weeks. During this adjustment period, both staff morale and operational efficiency can be impacted if not managed properly. Laboratory staff will go through a learning curve as they adapt to working with automation. It is important to remain present, actively listen to staff feedback and provide support, allowing time for both the new technology and personnel to integrate smoothly into routine operations.

Navigating changes

Adopting automation and new laboratory processes is a transformative journey that requires careful planning and adaptation. Laboratories must navigate significant operational shifts while ensuring minimal disruption to patient services. To facilitate this process, structured guidance is essential to support staff, integrate technology effectively and achieve long-term success.

As laboratories face increasing pressure to optimise efficiency, reduce turnaround times and enhance consistency, transitioning to automation requires a guided, structured approach, paying special attention to:

- Strategic workflow integration tailored to the lab's specific needs.
- Expert consultancy to facilitate seamless adoption.
- Continuous monitoring and support to drive sustained success.

The implementation process

This implementation process should follow a structured framework with defined phases, deliverables and exit criteria to support successful and efficient project execution. The approach ensures systematic tracking, risk management and effective stakeholder engagement across the project lifecycle, enabling laboratories to adopt automation without disrupting daily operations.

1. Opportunity analysis
   - Initial meeting: Define the project scope, align expectations and discuss the benefits of automation.
   - Impact assessment: Identify needed changes, who will be affected and why the change is needed.
   - Readiness check: Evaluate the lab's culture, leadership and ability to adapt to change.

2. Planning
   - Review current workflows to find inefficiencies and opportunities for automation.
   - Set clear goals and create a tailored plan.
   - Agree on success measures and assign a project team to lead the work.

3. Execution and implementation
   - Install and integrate automation into existing lab processes.
   - Train staff and run workshops to support the transition.
   - Review progress regularly and adjust as needed.

4. Performance review and ongoing support
   - Track performance and monitor key metrics.
   - Reach the agreed utilisation target.
   - Provide a final report with outcomes and recommendations.
   - Offer continued support for ongoing improvements.

Making data-driven decisions through workflow analysis

Both workflow analyses and utilising 0-100 measurement studies help laboratories evaluate their current processes and equipment, identifying areas for improvement. Implementing automation reduces turnaround time (TAT), manual labour and enhances productivity. A baseline study should be conducted before implementation, followed by a post-implementation study to quantify improvements achieved.

Collaboration and commitment for successful implementation

When it comes to implementing SMART Automation projects, ICs are key to successfully navigating challenges and maximising benefits of automation. They are great at keeping projects on track and managing various stakeholder groups.

ICs can also improve communication on projects, mitigate risks and streamline projects, including helping to triage and prioritise planned and unplanned challenges to move the project forward, within a shorter timeline.

A successful implementation should rely heavily on a strong commitment and close crossfunctional collaboration between the implementation team and the laboratory. Both parties play a vital role in driving progress and ensuring the project's success.

Laboratory responsibilities

- Project leadership: Designate a point-of-contact to coordinate internal activities and serve as the primary liaison with the implementation team.
- Engagement: Actively participate in training, workshops and process evaluations.
- Preparation: Complete required readiness activities, such as infrastructure adjustments or process changes, to support a smooth rollout.
- Ownership: Take an active role in adapting workflows and maintaining momentum throughout the project.

Implementation Team responsibilities

The implementation team brings together a range of professionals and expertise, each contributing specialised knowledge to support the project from start to finish:

- Project management: Guide the overall implementation process, ensuring timelines, goals and expectations are met.
- Training and support: Provide structured training and support to facilitate learning and adoption.
- Technical integration: Oversee the setup and integration of new systems or processes into the existing laboratory workflow.
- Monitoring and feedback: Conduct regular reviews, provide feedback and adjust the approach as needed to address emerging challenges.

A cross-functional approach like this ensures that all technical, operational and organisational aspects of the project are addressed, allowing for a smooth, structured and sustainable implementation.

The value of a structured and collaborative implementation approach

A well-structured implementation, led by a dedicated consultant and supported by a team with diverse expertise, offers clear advantages. This collaborative approach not only ensures a smooth transition, but also lays the foundation for long-term operational success.

Key benefits:

- Optimised workflows: Streamlined processes and reduced manual tasks improve overall efficiency.
- Enhanced productivity: Better resource utilisation and higher throughput support increased operational capacity.
- Improved quality and accuracy: Automation reduces variability and the risk of errors, strengthening quality control.
- Empowered staff: Involving laboratory personnel throughout the process builds confidence and supports a culture of continuous improvement and innovation.
- Operational continuity: A dedicated Implementation Consultant enables laboratory staff to stay engaged in the project while maintaining focus on routine operations, helping ensure seamless integration and adherence to timelines.

Conclusion

Transitioning to automated workflows in histology laboratories is a multifaceted endeavour that requires more than just new technology - it demands strategic planning, staff engagement and expert guidance. As laboratories grapple with growing demands and limited resources, the need for structured support becomes clear. Successful implementation hinges on the alignment of people, processes and tools to achieve sustainable improvements in efficiency, quality and turnaround time.

Having a dedicated Implementation Consultant plays a central role in bridging the gap between existing practices and new systems, helping teams adapt without compromising day-to-day operations. Likewise, fostering a culture of open communication and inclusivity ensures staff remain engaged and supported throughout the change process.

Crucially, success depends on collaboration across functions. A cross-functional implementation team - bringing together expertise in project management, technical integration, workflow optimisation and training - ensures that all aspects of the transition are addressed holistically. This collaborative structure supports knowledge sharing, faster issue resolution and alignment with laboratory goals.

Ultimately, effective laboratory automation is not achieved through technology alone but through a thoughtful, data-informed approach that respects the complexity of histopathology workflows and the expertise of the professionals who operate within them. By prioritising collaboration, structured implementation and continuous improvement, laboratories can not only navigate complexity but thrive within it.