WHITE PAPER

Improving Lab Efficiency & Productivity: The Hidden Cost of Manual Slide Handling

The direct costs of a glass-slide workflow are easy to see on a budget line. The indirect costs are harder to see. FTE hours spent on retrieval, assembly, transport, and misfiling; TAT delays caused by physical logistics; and staff time lost to avoidable rework can have a substantial impact on lab efficiency, productivity, and costs.

There is a specific pressure that every laboratory manager understands from the inside but struggles to quantify from the outside. Pathology request volumes are rising, with growth estimated at 5–10% annually (Munari et al., 2024). Aging populations, expanding screening programs, and the growing complexity of precision oncology workups are all contributing factors. Simultaneously, the laboratory workforce faces chronic understaffing: more histotechnologists and pathology staff are retiring than entering the field, and recruitment has become a persistent operational challenge in laboratories of every size (Walsh & Orsi, 2024). The result is a gap between what the laboratory needs to produce and the human resources available to produce it.

Most lab managers are managing this gap through informal means: longer shifts, deferred leave, informal cross-training, and the quiet absorption of excess workload by experienced staff who cannot sustain it indefinitely. What most have not yet done is a rigorous audit of where their current workflow is consuming time and staff capacity that a different infrastructure could recapture. The glass slide workflow is one of the largest sources of hidden inefficiency in the anatomic pathology laboratory. Yet much of that inefficiency remains invisible to the lab managers closest to it.

This article names and quantifies the specific lab efficiency workflow costs that manual slide handling imposes, draws on published operational data to show where the time goes, and makes the case for why addressing these costs is not simply a capital expenditure argument. It is a workforce sustainability argument.

The Anatomy of a Manual Slide Workflow: Where the Time Actually Goes

A glass slide does not simply travel from the histology bench to the pathologist's microscope. Between preparation and sign-out, it passes through multiple handling events: physical sorting and assembly into cases, batching for delivery or retrieval, transport between departments or sites, filing in the slide library archive, and — later — retrieval for comparison cases, tumor boards, ancillary testing, or external consultation. Each event requires staff time. Each event is a potential source of error. And each event is essentially invisible in a budget that records slides processed per day rather than staff minutes consumed per slide.

A published time and motion analysis showed that digital pathology implementation saved an overall 13.4% of the pathologist's workday — approximately 43 minutes and 9 seconds per day — through automation of case assembly, queries, requests, retrieval, and delivery (Hanna et al., 2020). That figure reflects pathologist time alone. The time savings for laboratory technical and administrative staff from eliminating manual slide logistics are substantially larger.

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Improving Lab Workflow Efficiency & Productivity at Scale

5 min
Saved per case in lab logistics

One study reported 5 minutes per case saved in laboratory logistics through digital workflows: 3 minutes from digital handling and transmission, and 1.5 minutes from preparation for multidisciplinary meetings. Across a high-volume laboratory, this translates to 2.3 fewer FTE in laboratory logistics roles. (Schwen et al., 2023)

That 5-minute-per-case figure may appear modest in isolation. In a laboratory processing 400 cases per day, it represents over 33 staff-hours per day, equivalent to approximately 2.3 FTE positions operating at full capacity. Not absorbed by a single overtime roster. Not compensated through informal effort. It is simply the unavoidable overhead of moving physical objects through a workflow that could instead operate digitally (Schwen et al., 2023).

The Six Categories of Hidden Workflow Cost

Published operational analyses consistently identify the same categories of avoidable cost in the manual slide workflow. They are not hypothetical. They are measured.

Cost Category	Operational Impact	What Digitization Eliminates
Slide file staff	Full-time personnel for retrieval, filing, dispatch. One published implementation found 3 fewer FTE needed in the slide file room after digitization.	Slide library FTE requirements are reduced through instant digital retrieval from any workstation.
Physical slide retrieval	Glass slide archival requests fell 93-97% after digital implementation at one major cancer center (Hanna et al., 2020).	Prior comparison slides immediately available in LIS without staff retrieval
Transport & courier costs	Batch dispatch to remote sites, courier fees, and time delays. One study reported reduction from 86 hours to 35 minutes for teleconsultation turnaround.	Digital transmission eliminates all physical transport costs and delays
Case assembly time	Manual sorting, batching, and assembly for sign-out and MDT. 3 min per case in lab logistics is the published benchmark (Schwen et al., 2023).	Automated digital case assembly from LIS; no physical sort or delivery required
Storage space & vendor costs	Off-site storage vendor fees, physical real estate for slide archives, slide degradation risk over time.	Projected $267K/yr savings at one institution from storage and personnel costs alone (Hanna et al., 2020)
Rework from misidentification	Bar code errors, mislabeling, and slide mix-ups. One study reported accessioning error reduction from 6.3% to 0.5% on switching to digital workflow (Schwen et al., 2023).	Automated barcoded digital workflows eliminate manual identification steps

The Workforce Equation: This Is Not Just About Efficiency

The laboratory workforce shortage is not a temporary phenomenon. A systematic review of the global pathology workforce concluded that the field faces a structural deficit that will deepen over the coming decade — driven by retirement demographics, inadequate training pipeline capacity, and increasing diagnostic complexity per case (Walsh & Orsi, 2024). This creates a compounding problem for lab managers: the same workflow that currently requires 2.3 FTE in logistics overhead will require those same 2.3 FTE from a shrinking pool of recruitable staff.

The Schwen et al. (2023) review of lessons learned from lab digitization highlights a dimension that budget analyses often miss: digital workflows are not only a cost-efficiency opportunity. They are also a staff retention and recruitment tool. Laboratory technology infrastructure is increasingly a factor in staff attraction and satisfaction, particularly for younger histotechnologists entering a job market where they can choose which employer offers the more modern working environment. A laboratory that requires 2.3 FTE of staff to perform work that a digital workflow automates is not only inefficient, it is at a competitive disadvantage in the recruitment market.

The Workforce Benefits of Digital Pathology

The 91% of pathologists who, in one survey, reported that digital pathology reduced turnaround times also reflected that it made their practice more satisfying and efficient (Jahn et al., 2020). The staff satisfaction dimension of workflow change does not appear in ROI calculations, but it is consequential for managers trying to retain experienced staff in a constrained talent market.

The answer to the efficiency constraint question is not asking existing staff to absorb more workload. It is eliminating the workload that does not need to exist. Manual slide logistics is workload that does not need to exist.

The Multidisciplinary Meeting Problem

One of the most concrete and underappreciated sources of manual workflow cost is the multidisciplinary tumor board (MDT). In a glass slide workflow, MDT preparation requires physical assembly and transport of comparison slides, coordination between pathology and clinical teams for case scheduling, and the sequential presentation of one case at a time as slides are physically managed on a microscope or projector. Published data indicates that digital tumor boards allow substantially more cases to be reviewed in equivalent meeting time, because physical slide management is no longer required. (Ardon et al., 2023).

The operational significance for a lab manager is direct: every MDT that currently requires 90 minutes of pathology staff time for case preparation could require substantially less with a digital workflow. At an institution with multiple weekly MDTs across oncology subspecialties, this translates to measurable hours per week of senior staff time recovered for diagnostic work rather than logistics.

The ROI Argument	The Memorial Sloan Kettering Cancer Center digital pathology cost analysis projected $267,000/year in savings from personnel restructuring, decreased vendor services, and storage cost reduction. Over a projected 5-year period, the total savings estimate was $1.3 million. These are not projected gains from improved diagnostic outcomes. They are direct operational cost eliminations from the manual slide workflow. (Hanna et al., 2020)

High Throughput and Scan Quality: Where the Infrastructure Choice Matters

Lab managers evaluating digital pathology infrastructure need to understand that not all scanners impose the same operational burden. A scanner with a high rescan rate creates a new source of manual workflow overhead. When a significant number of slides require repeat scanning because of image quality failures, staff must retrieve, monitor, and rescan those slides. Published comparative data on FDA-cleared platforms shows that rescan rates vary substantially across available systems (Kuhlman et al., 2025).

The Epredia E1000 Dx Digital Pathology Solution demonstrated the lowest rescan rate of all six currently FDA-cleared WSI platforms in the Kuhlman et al. (2025) comparative analysis, and is the first FDA-cleared system with an automated focal map rescan that triggers automatically on out-of-focus detection — without requiring manual staff intervention. For a lab manager whose workflow design is focused on minimizing touch points and staff overhead, this capability is directly relevant to the throughput case (US FDA, 2025). A scanner with high throughput and low staff-intervention rescan demands a smaller scan team and creates a cleaner workflow than one that introduces new manual quality management overhead.

A related and often-overlooked source of hidden staff overhead is the requirement to monitor the scanner continuously for problem slides — slides at risk of damage, jamming, or causing instrument fault. In a conventional workflow, these events stop the scanning run and require immediate staff intervention to identify, manage, and resolve before continuous operation can resume. The E1000 Dx addresses this through a safety container architecture: when the scanner detects that continued processing would risk damage to the slide or the instrument, the slide is automatically moved to a dedicated safety container and the scanning run continues

uninterrupted (US FDA, 2025). The operational consequence for a lab manager is clear. Staff are not tethered to the scanner during operation, and the FTE hours that would otherwise be absorbed by monitoring and intervention return to value-added work. In the context of this article's central argument, this is another category of manual workflow overhead that digital infrastructure eliminates rather than redistributes.

Conclusion: The Hidden Cost Is a Visible Opportunity for Lab Efficiency

The hidden cost of manual slide handling is not small. It is difficult to recognize because it is spread across so many different workflow steps. The slide file clerk. The courier contract. The assembly time. The MDT preparation. The archival retrieval request. Each of these is a real cost, staffed by real people, consuming real hours that the laboratory cannot afford to lose to logistics at a time when its diagnostic output per person needs to grow.

The lab managers who will be best positioned in 2026 and beyond are those who have already recognized that workflow efficiency is not a nice-to-have. It is the operational foundation that determines whether a laboratory can sustain its diagnostic mission with the workforce it can realistically recruit. Making that foundation digital is not an incremental improvement. It is the structural change that makes the mission viable.

How to Improve Lab Productivity & Efficiency: Key Takeaways for Lab Managers

1	5 minutes per case is the published manual workflow overhead for lab logistics in glass slide operations. Across a 400-case-per-day laboratory, this is equivalent to 2.3 FTE positions running at full capacity performing work that a digital workflow eliminates. (Schwen et al., 2023)
2	Archival slide requests fell 93–97% at a major cancer center after digital implementation. The FTE time previously consumed by filing, retrieval, and delivery of glass slides does not disappear from the workload — it disappears from the workflow entirely. (Hanna et al., 2020)
3	Workforce sustainability is the workforce argument. The laboratory workforce shortage is structural and deepening. Eliminating the 2.3 FTE of manual logistics overhead from a digital workflow is not just an efficiency gain. It is a redeployment of staff capacity toward work that requires skilled human judgment, in a labor market where skilled humans are in short supply.
4	Scanner rescan rate is a direct operational cost driver. A high-volume scanner that requires frequent manual rescan intervention — or continuous staff monitoring to catch problem slides — creates a new category of staff overhead. Selecting a platform with the lowest rescan rate and automated focal map rescan, and a safety container architecture that isolates problem slides without stopping the run (E1000 Dx Digital Pathology Solution) minimizes scan team staffing requirements and reduces workflow interruption.
5	The $267K/year figure is a benchmark, not a ceiling. The MSK projected savings — $267,000/year, $1.3 million over five years — were calculated conservatively from personnel restructuring, vendor cost reduction, and storage savings. They did not include TAT improvements, MDT efficiency gains, or the recruitment and retention value of a modern digital workflow. (Hanna et al., 2020)

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