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Accelerating your digital pathology adoption

A guide to realizing the benefits of large-scale
implementation through as-a-service solutions

Summary

Delivered as a service, digital pathology makes the benefits of scale accessible to all ranges of healthcare organizations and providers while removing adoption impediments. Here, we uncover key considerations— the advantages of digital pathology, the challenges and burdens a provider or lab may face, and deployment options to chart a way forward.

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Executive summary

The doctors who study disease can now immediately see and analyze digital biopsy images and securely share those files with other experts for a second opinion or for research purposes. The practice, known as digital pathology, has revolutionized the discipline that once depended on fragile physical slides and rugged microscopes.

Globally, the digital pathology market is expected to increase at a compound annual growth rate of 7.7% from 2023 to 2030. The UK government, for example, has invested the equivalent of USD 66M in scaling up national digital pathology and imaging. In the US, doctors at Yale New Haven Health are turning tens of thousands of histology glass slides into digital whole slide images. Those are just two examples of the many digital pathology implementations happening around the world.

Though healthcare organizations are wise in their eagerness to adopt digital pathology, a degree of uncertainty lingers. Many are asking: *How can we quickly and cost-effectively deploy digital pathology? How long will it take? How much will it cost? When will we see a return on investment?*

In attempting to answer these questions, one conclusion keeps standing out.

To reap the rewards of digital pathology in a reasonable timeframe, the implementation must be large-scale. It must have enough scope to accommodate a growing volume of data and rigorous operations. Such an implementation requires significant investments of capital, training, physical resources, and staff time.

This conclusion sounds daunting, but it doesn't have to be.

What is digital pathology?

Digital pathology involves scanning glass microscope slides to create digital whole slide images so the samples can be securely viewed, analyzed, shared, and stored. Instead of examining a tissue sample under a microscope, the pathologist can examine a scanned slide on a screen.

According to the Digital Pathology Association, "Healthcare applications include primary diagnosis, diagnostic consultation, intraoperative diagnosis, medical student and resident training, manual and semi-quantitative review of immunohistochemistry, clinical research, diagnostic decision support, peer review, and tumor boards."

With digital pathology, the pathologist is supported by technology tools for performing critical measurements, image and historical analyses, and pattern recognition. The digital sample is also readily accessible to other pathologists when a specialist or second review is needed. An abundance of published research validates the use of whole slide images to render diagnoses as comparable to the use of glass slides.

Healthcare organizations can achieve that same effective level of large-scale implementation – faster and cost-effectively – by partnering with capable and reputable service providers rather than attempting to handle everything on-prem. Often, these providers employ the popular as-a-service business model to make premium products and services more accessible.

Delivered as a service, digital pathology benefits of scale can be attained by all ranges of healthcare organizations and providers. This means financial benefits are achieved, and huge burdens are removed from the adoption process.

The following guide will support your healthcare organization in its objective to build a digital pathology practice that's cost-effective, resilient, and optimized.

Key point:

Healthcare organizations can achieve the same effective level of large-scale implementation — faster and cost-effectively — by partnering with capable and reputable service providers rather than attempting to handle everything on-premises.

Distinct advantages

Gaining widespread adoption, digital pathology offers many benefits, including its ability to:

> **Reduce cost and risk** for providers, labs, and other healthcare organizations via offsite storage and cloud capabilities.

> **Positively impact resource shortages** and enhance education, especially in research settings and in developing nations.

> **Facilitate collaboration** across geographic regions to leverage expertise, reach underserved populations, and get a secondary review on interesting examples.

> **Enable time-saving automation** to workflows and engage artificial intelligence (AI) and other algorithmic capabilities.

> **Support high-quality**, rapid, AI-based pattern and anomaly recognition.

Source: thepathologist.com/inside-the-lab/unexpected-benefits

Digital pathology is the future

Physicians, lab managers, and healthcare executives are recognizing digital pathology's growing number of advantages. There are the operational benefits of efficiency, accuracy, and risk reduction.

And there's the big-picture benefit of innovation–preparing your healthcare organization to stay competitive in a fast-approaching future where AI, automation, and real-time collaboration will be standard practice.

Consider these **6 tactical, day-to-day wins of digital pathology:**

> Leading researchers see digital pathology and AI solutions as supporting the quality of life for patients worldwide.
>
> *Frontiers in Medicine*

1. Whole slides stay securely stored offsite to be adequately preserved, reducing risk. Read the solution brief.

2. An outside professional service can manage slides and blocks, freeing up time and space for staff.

3. Holistic management of physical slides and scanning operations helps maintain an auditable chain of custody.

4. 24/7 online ordering, tracking, and reporting through a secure web-based portal supports accessibility. Watch the video.

5. AI algorithms can analyze digital images, enabling rapid pattern recognition and enhancing medical workflows. Slide images can be directly linked with medical records and other patient data.

6. Cloud capabilities allow pathologists in other locations to efficiently and securely aid fellow physicians in their work.

Supporting the science *and* the business of pathology

Experts, including the World Economic Forum, expect technologies like AI and machine learning to help transform global health outcomes by improving data analysis, medical diagnosis, and healthcare delivery. In pathology, AI predictive models will support disease detection, research, and prevention and guide physicians in creating personalized treatment plans. AI can also help teams automate mundane tasks to make workflows run more efficiently.

Increased efficiency

AI and digital pathology together enable the automation of routine, time-consuming tasks, including image annotation and data organization. Pathology workflows streamlined by AI give pathologists more time to focus on complex decision-making. AI can also be trained to identify and quantify cell count, shape, and distribution for rapid feature detection and quantification in tissue and cell images. Researchers will see results that are more reliable and less prone to errors.

Enhanced quality

AI algorithms can analyze massive amounts of data with high levels of precision to assist pathologists in working with patient records and other large datasets. In addition to efficiency gains, the capability helps pathologists detect patterns and anomalies, such as rare subtypes or unusual features.

In one recent study, AI showed promise in supporting and even standardizing the pathologist's work on tumor grading. The algorithm returned more consistent scoring than the study's four participating pathologists.

> "The deployment of computational pathology and applications of AI tools can be considered as a paradigm shift that will change pathology services, making them more efficient and capable of meeting the needs of this era of precision medicine."
>
> *Journal of Clinical Pathology*

Collaboration

By collaborating via digital pathology systems, pathologists achieve a more comprehensive analysis–a 'second set of eyes' to cross-check assessments. This additional human assistance can lead to better-informed treatment plans, improving patient prognosis with early detection and targeted therapies. In addition, pathologists who used an AI tool designed to detect and quantify mitoses reported an overall time-savings of 27.8% compared to manual methods.

Medical and educational workflows

An investment in digital pathology infrastructure would support education and clinical care, according to recent studies. This could reduce the barriers–such as lack of time or resources–that hinder learning and access to pathology services across healthcare systems and entire regions.

Consider the growing rates of diabetes and heart disease. Or predictions from the International Agency for Research on Cancer of more than 27 million new cases per year by 2040. Healthcare providers will need to be able to deliver accurate, timely diagnoses and provide actionable follow-up information–expectations that can be met by having a sturdy digital pathology practice in place. At the same time, educators must find ways to expand pathology education to remote locales.

Evidence of cost-effectiveness

What efficiency looks like for pathologists:

Digital pathology systems have been validated by research published in the [Modern Pathology](#) journal for their ability to reduce case backlogs, ease collaboration with peers, and speed preparation times for tumor boards. A digital approach also allows remote work to support geographic challenges and avoid unnecessary trips to the lab.

Documented efficiency gains include:

› Access for remote sign-out, when appropriate and as needed.

› An AI-enhanced method to review and render diagnoses.

› Broadened clinical expertise through worldwide collaboration opportunities.

› Scalable digital management of slides that can make data accessible and keep patient information secure.

What efficiency looks like for lab managers:

Digital pathology drives faster case turnover and, therefore, increased productivity and volume of work, [according to experts](#) from the Diagnostic and Research Institute of Pathology in Austria. It also reduces cost by cutting the time histology techs must spend prepping slides or making duplicates.

Documented efficiency gains include:

› Fewer courier charges as digital files are available immediately.

› More affordable storage options, including offsite vaults and tiered levels.

› Reduced labor costs in the lab as processes no longer require duplication and mundane tasks can be automated.

› Ability to reuse images, saving hours of unnecessary labor.

Pioneering ROI case study

In a [crucible study](#), the pathology department at Memorial Sloan Kettering Cancer Center's digital pathology operation showed a noteworthy increase in efficiency and operational utility.

Comparative cost analysis showed a USD 1.3M in savings over five years and a one-day decrease in turnaround time. In a related digital pathology experience survey, 80% of respondents reported improved clinical sign-out using whole-slide images.

Researchers also noted a five-year digital pathology cost analysis from the University of Pittsburgh Medical Center that projected an overall USD 17.73M savings across their large-sized distributed health network.

Benchmark data and metrics can be applied to any organization to gauge the impact of digital pathology deployments. Returns on investment can be calculated by the reduction in glass slide requests as whole slide images become available, the decrease in confirmatory testing for patients with metastatic/recurrent disease, the long-term decrease in off-site pathology asset costs, and faster turnaround times throughout the pathology workflow.

Main takeaway: *The ROI is impressive, but it's vital to note that a digital pathology practice implemented on-prem requires large investments in capital, training, physical resources, and time. That investment only becomes lucrative after a faraway time horizon. Organizations can rapidly access the benefits of a large-scale deployment by partnering with a capable and reputable as-a-service provider to meet the scalable volume of scanning, storage, and access needs.*

What efficiency looks like for healthcare organizations:

Digital pathology allows physicians, educators, and medical students to make massive leaps in speed, accuracy, and collaboration. The tangible benefits for healthcare organizations as a whole come in the form of improved patient care but also in business value.

Documented efficiency gains include:

> Consolidation of smaller, disparate histology labs into larger centralized labs.

> Avoided treatment costs due to reduced rates of interpretive errors by general, non-subspecialist pathologists within the institution.

> Loss avoidance as properly managed scanned images cannot be lost or broken.

> Removal of image quality control burden when outsourcing a comprehensive solution.

Sources: Journal of Pathology Informatics and Frontiers in Medicine

Meeting the need for scale

On the verge of becoming mainstream, digital pathology shows great potential along with significant barriers to adoption.

Lab managers already grapple with a growing volume of slides and blocks while trying to maintain the integrity of their inventory and provide on-demand access. On-prem scanning and storage systems pile on, plus require considerable upfront capital and have a lengthy break-even point.

In short, digital pathology looks like a long-duration investment. But it doesn't have to be. The benefits of a large-scale deployment can be achieved more quickly and cost-effectively.

Iron Mountain offers as-a-service digital pathology options, adding to its extensive holistic services. Iron Mountain manages not only the physical slides' transport, storage, and retrieval but also the transport, storage, and access to the scanned image after slide scanning. All of this, plus security and a documented chain of custody. These solutions deliver efficient ways to deal with proper slide scanning, storage, and management – without the major investments that come with implementation and infrastructure.
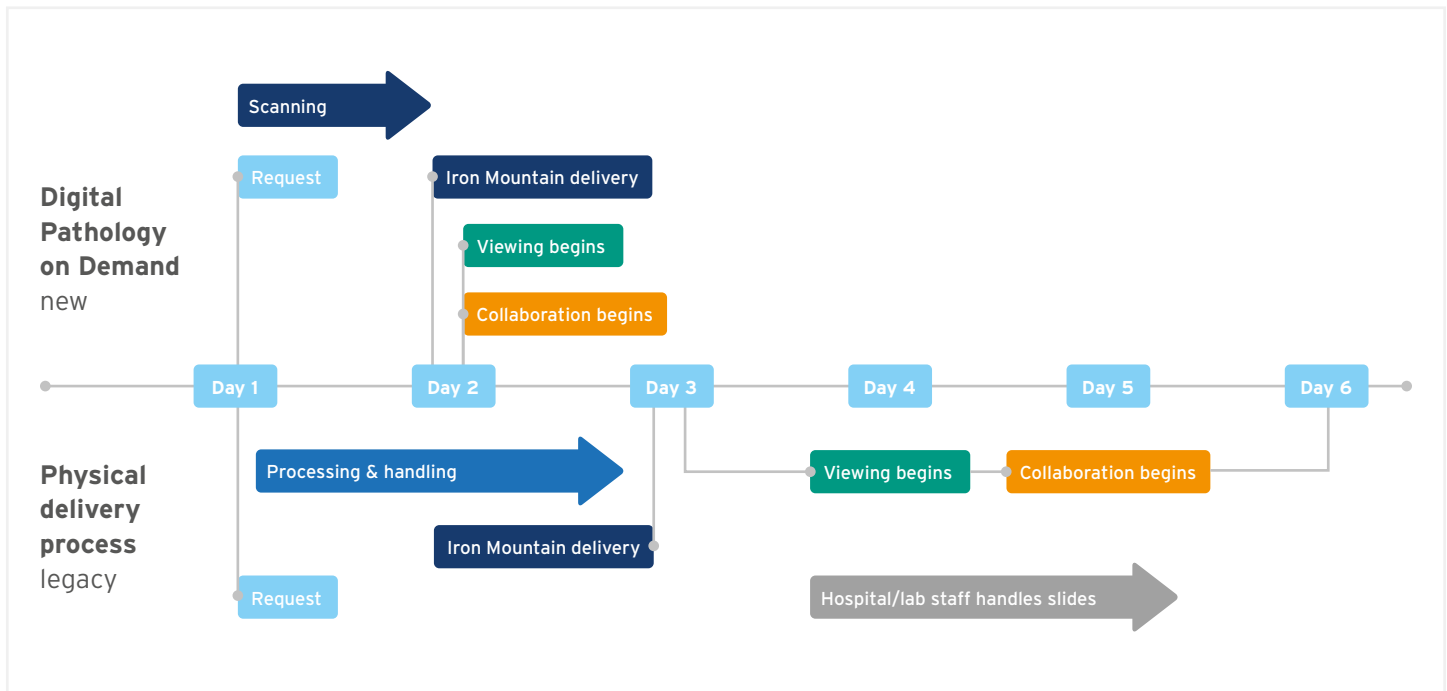
🔑 Key point:

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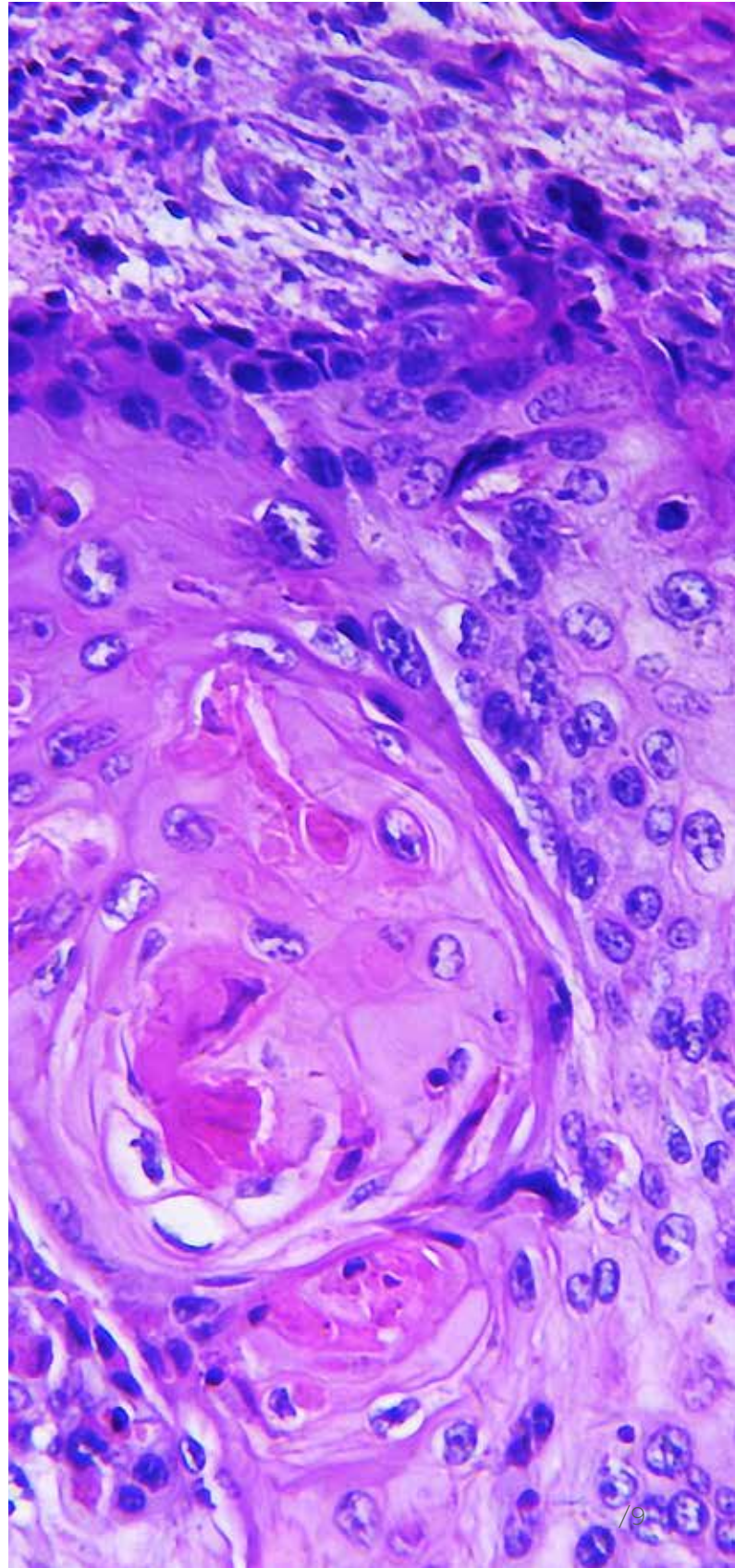
Iron Mountain speed and collaboration

Relieving the burdens of an on-premises approach

When handled properly, an as-a-service model removes many of the impediments experienced by an on-premises approach – namely the cost/benefit structure, as well as concerns related to quality control, compliance, data security and access, staff upskilling, and long-term storage.

> Economic advantages of the as-a-service model include predictable cost, low upfront investment, scalable usage, accessibility, and customization.

Similar to the exceedingly popular software-as-a-service model, solutions such as Iron Mountain's Digital Pathology On Demand provide as-a-service benefits. This eliminates multiple needs: hardware acquisition and maintenance, large up-front expenses, training, handling of slides, IT burdens (transport and storage of data), and allocation of precious on-premises floorspace.

There are significant financial gains from an investment in workflow efficiency and automation. Extensive customer research by Iron Mountain's Innovation team reveals that Digital Pathology On Demand enables quicker slide image viewing from the initial request to when the pathologist can look at the whole slide imaging data. The research also found that Digital Pathology On Demand increased access for collaboration anywhere and provided security for time-sensitive retrievals from storage.

There are also significant financial gains from money not spent. When organizations select an as-a-service solution, they avoid the substantial costs of training staff to operate scanners and leveling up their IT to support storing and moving large volumes of data. They also avert the expense and risks associated with compliance, data security, and physical slide transportation.

Next steps

Deploying and maintaining a digital pathology solution at a large scale can be cost-prohibitive for any organization.

The situation makes it difficult to deliver cost-effective results, especially in healthcare settings where resources are limited and budget demands are high. Some facilities may not have established the infrastructure and assets needed to support digital pathology systems.

Yet, there's an imperative to implement digital pathology – for the sake of better workflows and operational efficiencies. Leadership and physicians can see the future innovations made possible by workflow automation, real-time collaboration, AI image analysis, and other digital capabilities.

> The as-a-service model is emerging just in time to fill the gap between the need to adopt digital pathology systems and the inability to adopt at scale using in-house resources.

Additional recommendations include exploring funding opportunities, grants, and partnerships with organizations that support telemedicine initiatives along with cost-sharing models or cloud-based solutions to reduce the initial investment. Healthcare organizations can also work with local governments, other healthcare networks, and technology providers to improve infrastructure, such as broadband connectivity and reliable power supply.

Delivered as a service, digital pathology makes the benefits of scale accessible to all ranges of healthcare organizations and providers while removing adoption impediments. Robust growth in the digital pathology service provider market is prompting more widespread adoption.

Healthcare businesses and providers should research and consider engaging digital pathology service providers as they incorporate this revolutionary technology into their processes and practices.

Iron Mountain is a trusted partner

As an experienced global service provider, Iron Mountain can help healthcare organizations of all sizes achieve digital pathology implementation at scale. Enterprises worldwide rely on Iron Mountain to store, protect, and manage their assets and information. This includes over 2,000 healthcare customers, the top 10 global pharmaceutical companies, and 94 imaging centers that digitize more than 1.5 billion documents annually. **Iron Mountain also maintains 850 million patient records, 1 billion+ medical images and 1 billion+ pathology slides in its secure storage.**

850 million
patient records

1 billion+
medical images

1 billion+
pathology slides

Getting to know Digital Pathology On Demand

The Digital Pathology On Demand (DPOD) solution from Iron Mountain is designed to improve collaboration and drive operational efficiencies. The solution converts physical glass pathology slides into digital whole slide images and captures the metadata, linking them to the patient's medical record.

The DPOD solution combines professional services, hardware, and software to improve speed and access to high-value slide images. **Critical points for considering the Iron Mountain DPOD solution:**

› Digital slides are requested via role-based access and made available electronically through the proven Iron Mountain portal.

› Patient health information is protected via cyber encryption.

› DPOD is secure and scalable, stored in trusted Iron Cloud Object Storage.

› Organizations will save the time it would take to physically manage slides or await retrieval from archival storage.

› The DPOD digital environment ensures whole slide images can be searched, annotated, and shared to facilitate collaboration.

› Backup copies of slide images and an auditable chain of custody are created to provide secure, long-term image storage cost-effectively.

For more information, visit
www.ironmountain.com/digital-pathology

About Iron Mountain

For over 70 years, Iron Mountain Incorporated (NYSE: IRM) has been your strategic partner to care for your information and assets. A global leader in storage and information management services and trusted by more than 225,000 organizations around the world, including 95% of the Fortune 1000, we protect, unlock, and extend the value of your work—whatever it is, wherever it is, however it's stored.

We create the framework necessary to bridge the gaps between paper, digital, media, and physical data and extract value along its lifecycle, helping to build your organizational resilience. And all this with a commitment to sustainability at our core.

Our relationship is a true collaboration where you trust us not only to preserve institutional knowledge and enhance efficiency, security, and access but to make your work mean more. Because in that work is the power to not only accelerate your business but elevate it.

Trusted by more than 225,000 organizations around the world, and with a real estate network of more than 85 million square feet across more than 1,400 facilities in over 50 countries, Iron Mountain stores and protects billions of valued assets, including critical business information, highly sensitive data, and cultural and historical artifacts. Providing solutions that include information management, digital transformation, secure storage, secure destruction, as well as data centers, cloud services, and art storage and logistics, we help customers lower cost and risk, comply with regulations, recover from disaster, and enable a more digital way of working—and all this with a commitment to sustainability.

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Iron Mountain Incorporated (NYSE: IRM), founded in 1951, is the global leader for storage and information management services. Trusted by more than 220,000 organizations around the world, and with a real estate network of more than 85 million square feet across more than 1,400 facilities in over 50 countries, Iron Mountain stores and protects billions of information assets, including critical business information, highly sensitive data, and cultural and historical artifacts. Providing solutions that include secure storage, information management, digital transformation, secure destruction, as well as data centers, art storage and logistics, and cloud services, Iron Mountain helps organizations to lower cost and risk, comply with regulations, recover from disaster, and enable a more digital way of working. Visit www.ironmountain.com for more information.