

Cambridge's journey towards an automated workflow

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The service at a glance

A regional tertiary and quaternary histopathology and diagnostic cytology service on the Cambridge Biomedical Campus

~70,000

diagnostic cases a year

~500,000

slides a year

~260,000

wax blocks a year

~100 + 38

laboratory staff and consultants

What it underpins

- The largest multi-organ transplantation service in Europe
- Designated paediatric, cardiothoracic and neurosciences centres
- Twelve subspecialty reporting teams
- The new cancer hospital and children's hospital on campus

Standing and accreditation

- UKAS accredited to ISO 15189:2022
- OECl comprehensive cancer status
- Training accredited by the GMC, the National School of Healthcare Science, the IBMS and the HCPC
- Around 40% of laboratory activity referred in from other providers

A failing service in a failing building

2023 into 2024 — four problems that reinforced each other, in a large tertiary centre with a near-complete consultant body

1 Performance

- Around 40–45% of cases reported within 10 days
- A backlog of roughly 6,700 cases
- 20% of activity outsourced

2 Estate and infrastructure

- Cramped, split-site accommodation
- Storage held in circulation space
- A single lift prone to failure; rooms too cold to work in

3 Workforce

- Vacancy rate above 20%, high turnover
- Fatigue, low morale, stretched rotas
- No headroom for training or development

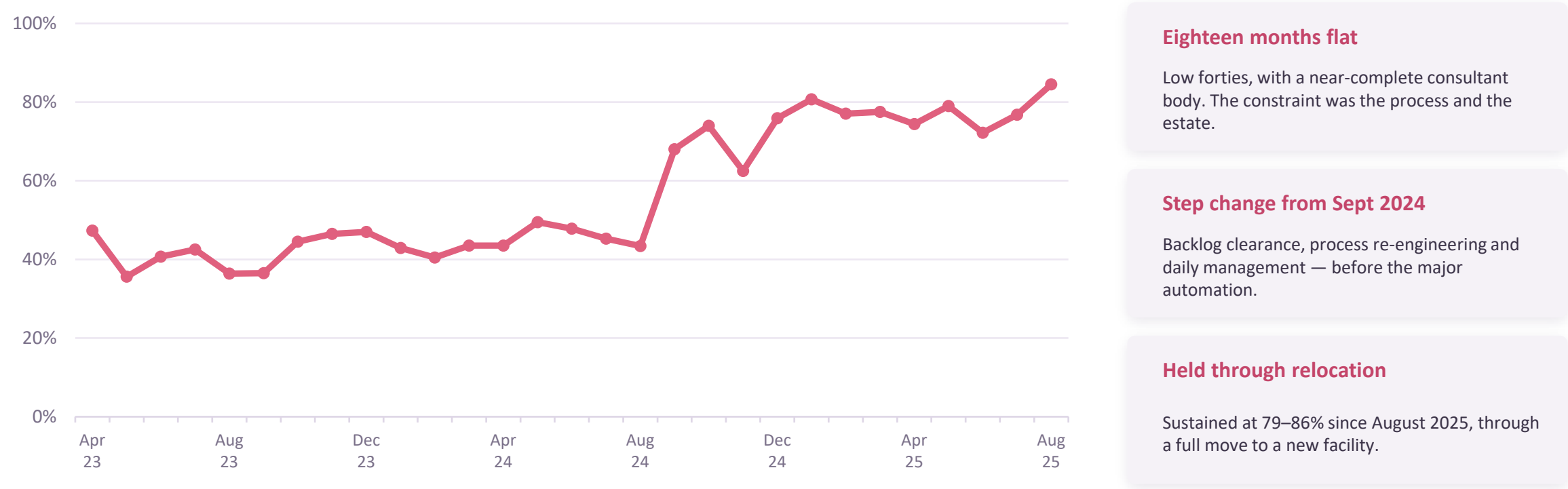
4 Process and technology

- Processes essentially unchanged for decades
- Batching and manual handling at every stage
- UKAS accreditation suspended

>6000 cases breached. Long waits for diagnosis, clinical risk carried by patients, and a workforce that could see the problem and had no way out of it.

A step change, then held

Percentage of histopathology cases reported within 10 days — NHS England Pathology Quality Assurance Dashboard, all cases



~5%

vacancy rate, from over 20%

Zero

outsourcing, and no lab backlog

ISO 15189:2022

UKAS accreditation reinstated

5,514 → 879

monthly breaches

Source: NHS England Pathology Quality Assurance Dashboard — all histopathology cases, cancer and non-cancer.

The improvement roadmap

Seven steps, run in sequence — the order matters more than the speed



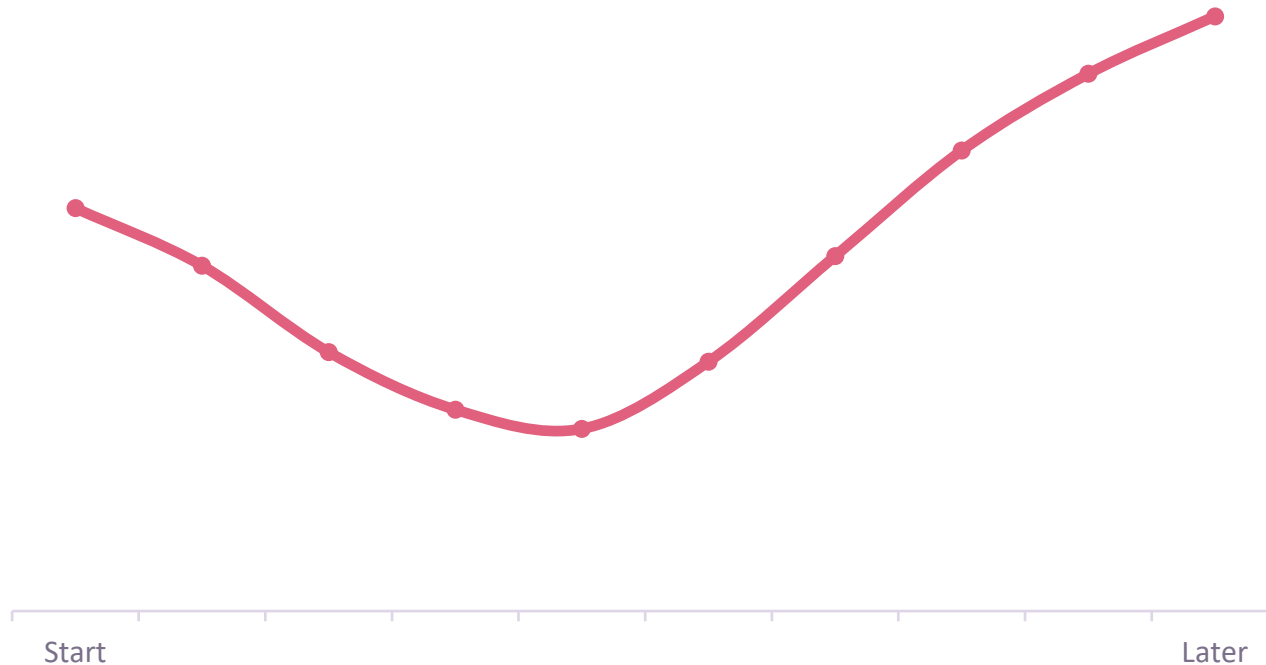
The order is the lesson. Services that start at step seven — buying technology before they have the data or the plan — automate a broken process and are then surprised when performance does not move. We spent the first months on steps one to three and nothing visible happened. That was the investment.

Expect the J-curve. Performance dips before it recovers. Say so in the business case, so the dip reads as a predicted milestone rather than as failure.

The J-curve

Performance dips before it recovers — this is where most transformation programmes are abandoned

Performance



Illustrative — the shape of the change curve, not CUH data.

What we told people in advance

- New processes are slower before they are faster — people are learning while running a live service
- Say so before it happens, to executives and to staff, so the dip is evidence of progress rather than of failure
- Agree in advance how long you will hold the line before changing course
- Protect the plan through the dip

Taking a hundred people through the change

Staffing was the constraint, the risk and — in the end — the reason it worked

A leadership programme for Band 6 and above

Launched by the Transformation Lead, delivered externally and funded by the Trust. Two cohorts of around fifteen, one day per module across four months, with action learning sets in between.

Launch and vision

How I lead others

Leading teams through change

Communicating and influencing

Embedding and evaluation

Compassionate leadership, psychological safety, the line manager as coach, feedback, situational leadership, dealing with uncertainty and difficult conversations.

“

The department feels more cohesive. The lab feels calm — there is less rushing.

“

The new laboratory and the automation have allowed us to be upskilled — and motivated to come to work.

Explicit about automation and jobs

Automation aligned to roles from the outset. Reassure, then upskill. No one was automated out; it closed a vacancy gap we could not recruit into

Training and development rebuilt

Weekly scheduled CPD, an internal restructure to support education, and a competency framework — development as a retention lever

Designed by the people who work in it

All-staff design requirement workshops — staff challenged current ways of working and set the functional relationships



Functional design workshops, open to every band



Mapping critical adjacencies, function by function



Ideas captured and prioritised — nothing off the table

What we asked of them

- Challenge the current way of working, not just relocate it
- Define which functions must sit next to which, and why
- Design the rooms you will actually work in
- Say what would not work — early, while it was still cheap to change

Engagement was the delivery mechanism, not a communications exercise. Staff who design a laboratory defend it when it is hard.

From staff workshops to a building shaped by the process

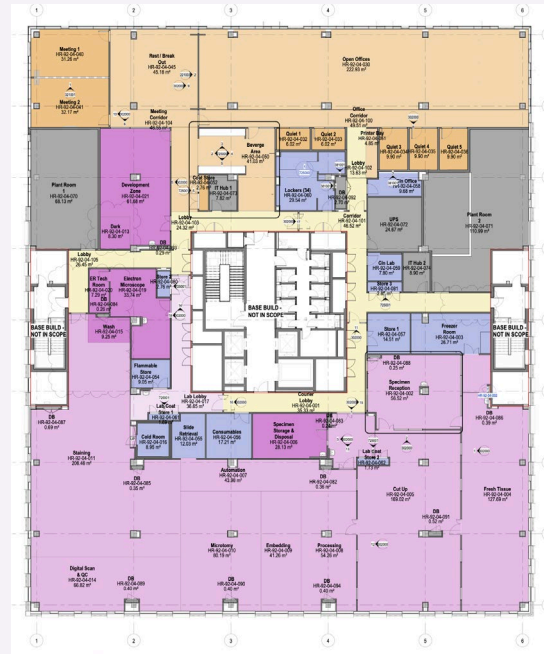
The functional relationships staff mapped became the floorplan

Functional relationships, mapped by staff



Every function placed against every other, then rationalised into zones

The resulting floorplan



Process-based laboratory design — 1000 Discovery Drive, live September 2025

What that bought us

- Every function process-mapped, then gap-analysed against where automation could genuinely help
- Upstream and downstream dependencies identified — wax quality, tissue sampling and embedding quality all had to change to make automated sectioning work
- Built automation-ready: power, footprint and interfaces designed in rather than retrofitted
- Headroom for around fifteen years of projected growth
- Performance held through the move; accreditation regained against the redesigned service

The laboratory design framework

Aligning people, process, technology and design — the method we used, and the one that transfers

Phase 1

Solution design and specification

- Data collection and process optimisation
- Resource planning and functional consolidation
- Strategic direction and business case
- Functional relationships and requirements

Phase 2

Design and procure

- All-staff design workshops and room concept designs
- Space consolidation
- Technology selection and business case
- Transition planning and readiness
- Knowledge transfer to the professional team

Phase 3

Build, transition and ramp-up

- Construction, commissioning, installation, relocation
- Service transition and performance risk mitigation
- Process and technology adoption
- Process adjustment and performance tracking

The five themes we held to throughout

Demand and quality

People and skills

Technology

Processes and decision making

Sustainability

Starting with data — what we built first

The step that cost nothing and made everything after it possible

What we built first

- A detailed capacity plan, section by section, with baseline WTE for every bench — reception, dissection, processing, embedding, microtomy, staining, IHC, special stains, digital and QC, cytology
- Granular process-level data taken from the LIMS rather than from opinion
- Every case tracked through defined states, so we could see where cases were sitting and for how long
- Demand, capacity and backlog modelled together, so the plan had arithmetic behind it

The case states we tracked

Booked in

Dissected

Embedded

Microtomy complete

QC complete

Awaiting reporting resource

Case assigned

Authorised

Clearing the backlog took five months

No new building, no new equipment, no additional establishment — process and grip alone

	May 2024	By early 2025
Cases in backlog	~6,700	182
Blocks over 7 days in the lab	>10,000	150
Cases reported within 10 days	44%	72%
Activity outsourced	20%	<5%

- ### How
- A backlog clearance plan with named priorities
 - Daily proactive management of the queue
 - Around 12% of capacity ring-fenced for change
 - Predictable daily throughput, so the plan held
 - Clinical leadership visible throughout

Case backlog and 10-day compliance at October 2024; block backlog and outsourcing at March 2025.

This phase cost almost nothing. It is available to every service in this room, today, before any capital lands.

Why automation, and not just improvement

The case for change that the automation strategy was built on

Why the old model could not hold

- Workload up more than 30% on pre-pandemic levels, and rising in complexity — immunohistochemistry and genomics
- A local, national and international shortage of biomedical scientists
- The core process is essentially 150 years old and largely manual
- It does not scale: more demand means more hands, and the hands are not there
- Manual handling carries an inherent risk of sample mix-up and crossover
- On that trajectory it is not possible to meet the demands of the service

1

Improving patient care

Timely reporting, a safe and high quality service, and expert input into MDTs

2

Supporting our staff

More staff, career and development routes, wider access to entry, research opportunities

3

Building for the future

A new facility, the new cancer and children's hospitals, digital pathology, genomics, automation and process engineering

The strategy was written against those three commitments, and every automation business case has been argued back to them.

Why automation, and not just improvement

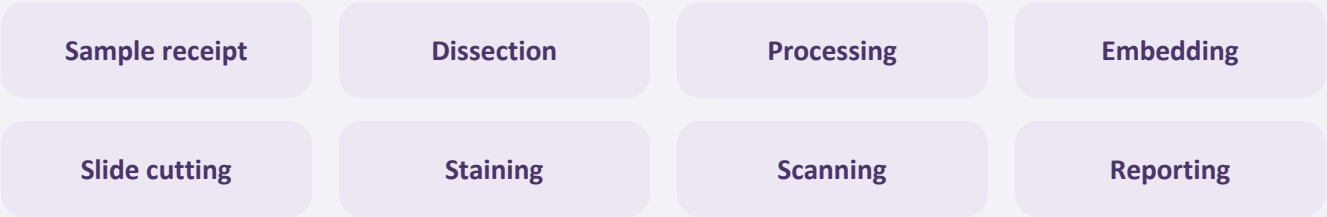
The case for change that the automation strategy was built on



The automation strategy

Sixty to seventy per cent of the workflow is technically in scope — the strategy decides in what order, and why

In scope for automation



Stays manual

Ordering, complex specimen work and the judgement-led steps. Thirty to forty per cent of the work — and the part we want our scientists spending their time on.

The four rules we set ourselves

It is not one size fits all

Adopt only what benefits your service, your estate and your case mix

LIMS interfacing is the project

Uninterfaced automation delivers a fraction of its value and can add a manual step

Phase the rollout

We began at 20% of blocks and grew as validation and confidence allowed

Validate before you scale

Verification, validation and QMS sign-off at every expansion



SAMPLE EXTRACTION/
CLINICAL DATA



 Commercial Product
Widely Deployed

 Commercial Product Limited
Deployments

 Prototype

Block Retrieval/
Slide Cutting for NGS/
Cancer Vaccine



Frozen Section/
WGS



Processing



AI/Digital
Pathology

Slide
scanning

Staining

Microtomy/
Block Cutting

Embedding

DIAGNOSIS/TREATMENT

Where we are on the roadmap

Live today, in implementation, and funded or in business case

Live

- AS-410M automated sectioners — up to 96 blocks every four hours, walk-away operation
- Automated trimmer working hand in hand with the sectioners
- On-demand laser slide and cassette printing, replacing batched inkjet
- Automated H&E staining platforms
- Whole-slide scanning of the full workload since May 2025
- Around half of all blocks now sectioned automatically, up from 20% at first rollout

In implementation

Inpeco FlexPath — the first system of its kind installed in the UK

- Automated embedding, pneumatic block transport, short-term archive and retrieval
- End-to-end block traceability as middleware to the LIMS, supporting ISO 15189:2022 and HTA compliance
- Epic Beaker interfacing — the dependency that governs the benefit

Continuous loading BOND PRIME platform

Next, funded or in business case

- An autonomous robot to load and unload the autosectioners, enabling overnight sectioning without night staff
- A third AS-410 sectioner, taking automated microtomy towards 70% of blocks
- A laboratory intelligence tool for real-time operational oversight
- AI-assisted quality control and digital block check

None of this was bought as a bundle. Each element was mapped to a measured bottleneck, business-cased on its own merits, and sequenced so the interfaces existed before the equipment arrived.

What automation has actually delivered

Measured benefit from our own data, not vendor claims

	May 2024	Now or committed
Blocks over seven days in the laboratory	>10,000	Backlog cleared
Activity outsourced	20%	None since May 2025
Vacancy rate	19%	~5%
Blocks sectioned automatically	20%	~50%, heading for 70%
Staffing at embedding, scraping, sorting and tracking	5-7 WTE	2 WTE for standard blocks

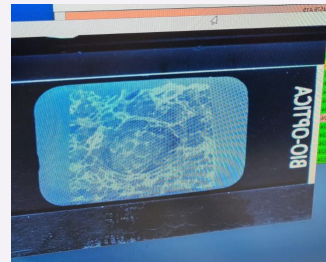
And on the bench

- Staff re-allocated to other tasks.
- Mislabelling risks reduced by on-demand printing and in-machine tracking
- Reduced repetitive strain injury and related sickness
- Continuous flow rather than batching, so peaks hurt less
- Upskilling of staff
- Increased training and education

Throughput increased without additional establishment.

What automation has actually delivered – AS410

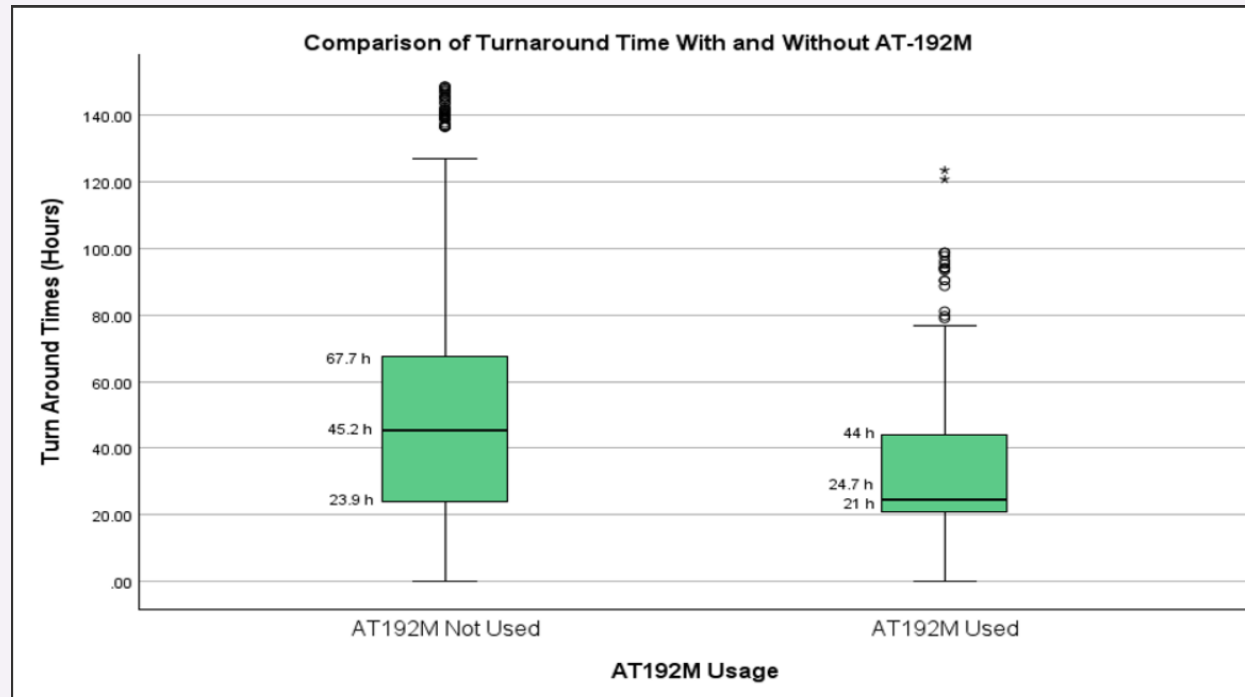
Measured benefit from our own data, not vendor claims



- Ability to section most tissues at set parameters
- Ability to section up to 96 blocks every 4 hours and allows continuous workflow
- Ability to run as a walk-away system
- Eliminates mis-labelling errors due to on-demand slide printing and tracking within the AS410.
- Reduces RSI related injury to staff through automation of trimming and sectioning of tissue
- Improves quality and standardization of sections and H&E stain, leading to better digital images
- About 50% of blocks being sectioned on AS410

What automation has actually delivered – AT192

Measured benefit from our own data, not vendor claims



- 14,686 cases were included in the analysis, covering January 2025 to September 2026. The analysis looked specifically at the time from Embedding Complete to AS-410 Complete, rather than the complete end-to-end laboratory turnaround time. This represents a difference of approximately 20.6 hours in median time between the two groups.

	AT-192M not used	AT-192M used
Cases (n)	13,236	1,450
Median time	45.22 hours	24.65 hours

What automation has actually delivered – Cassette and slide printers

Measured benefit from our own data, not vendor claims



- Moving from batched inkjet slide/cassette printing to on-demand Laser slide printers
- LIS integration in process
- Reduces mislabelling errors
- Removes additional QC step on downstream processes
- Compatibility with digital scanners
- Faster throughput – Increased productivity
- Reduces waiting time
- Minimal maintenance required

Where we are on the roadmap – Future development



What makes investment actually deliver

1

Review your existing process and data

It needs no capital and it is the precondition for a business case that survives scrutiny — and for proving benefit afterwards

2

Trust-level Engagement

Engage with your Executive team with a clear vision

3

Fund the interface, not just the instrument

LIMS integration is the project; hardware is an input to it. It is where budgets are most often short

4

Readiness of the estate and the infrastructure

Kit that lands before its interface or its floor space delivers nothing

5

Model the benefit at case level

So you can evidence what the money bought, and make the case for the next round

6

Write the J-curve into the plan

Predict the dip so it reads as a milestone, not a failure, when performance wobbles

In the staff's words

“

The department feels more cohesive. The lab feels calm — there is less rushing.

“

This has been a tough journey, but the changes have been worth it.

“

Being able to provide a high quality service, and to reduce waiting times for diagnosis, feels much more rewarding.

“

The new laboratory and the automation have allowed us to be upskilled — and motivated to come to work.

Staff comments gathered after the relocation. Retention improved because the work changed, not because we found more money for pay.

Key lessons from the journey

What we would tell a service starting this now

1

It takes time

There is no version of this that is quick. Plan in years, and protect the plan through the difficult quarters

2

Staff engagement is not a workstream

It is the delivery mechanism. Include the clinical team from the first conversation, not at sign-off

3

Have a long-term vision, not a shopping list

A published long-term automation strategy is what secured Trust support for each individual scheme

4

Interface to the LIMS

Where it is relevant, it is the difference between a benefit case realised and a benefit case written

5

Review the workflow first

Automating an unexamined process locks in the process. Map, then gap-analyse, then buy

6

It is not one size fits all

Adopt what benefits your service, your estate and your case mix. Our answer is not everyone's answer

Some of the team behind it all!

