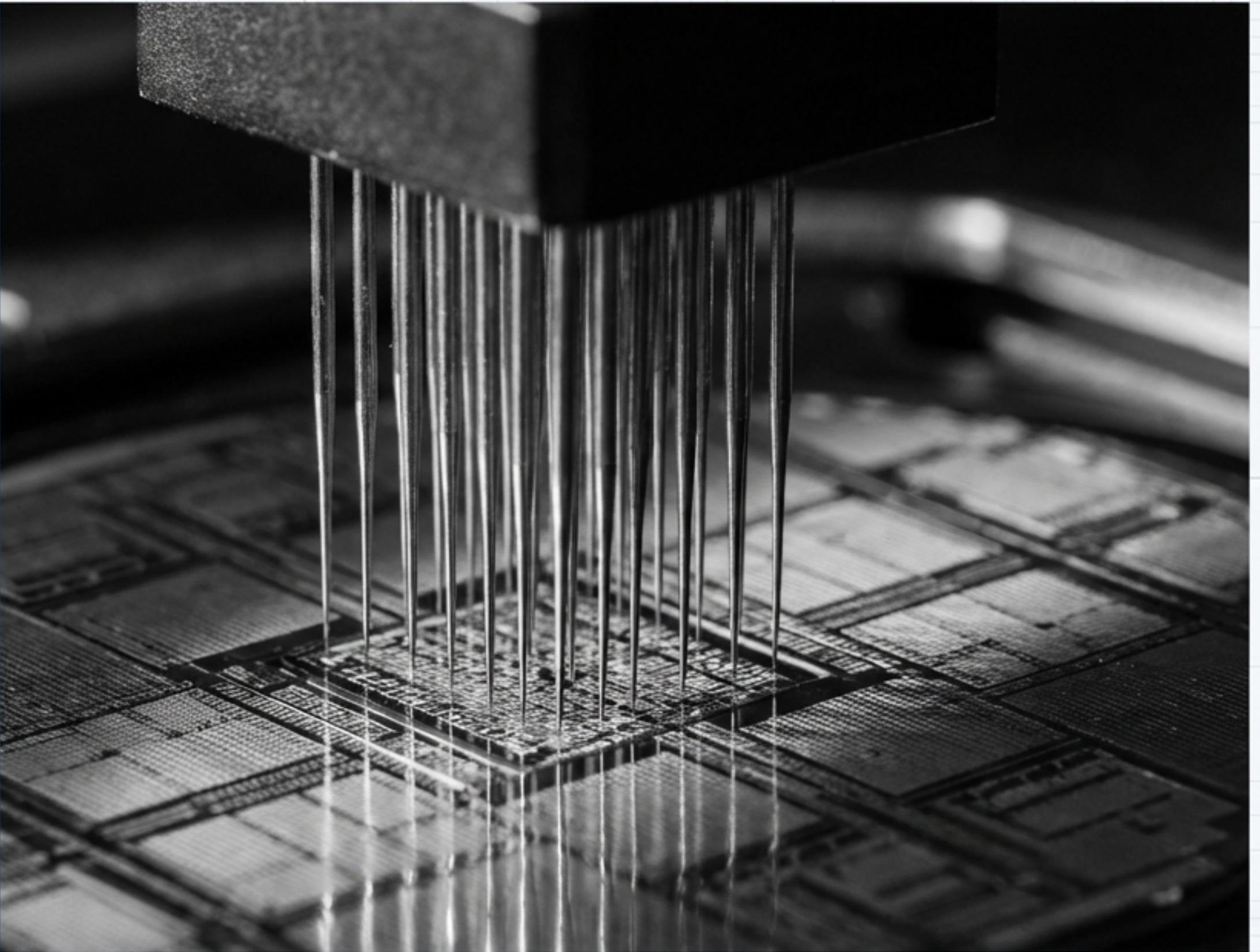


# Transforming Probe Card Repair: From Bottleneck to Competitive Advantage

A Lean Six Sigma Master  
Black Belt Project Report |  
Honeywell SPS – Richardson,  
TX

Author: Colin Henry  
Submission Date: February 07, 2026



# EXECUTIVE SUMMARY: RESTORING CAPACITY AND RECOVERING \$1.06M



## THE CHALLENGE

Probe cards—critical test assets—were trapped in a “Hidden Factory” of manual paper logs and disorganized processes.

Availability fell below 50%, forcing reliance on slow, expensive external vendors.

## THE RESULT

**\$1.06  
MILLION**

Annual Cost  
Avoidance

**97%+**

Asset Availability  
Restored

**0**

External Vendor  
Reliance

Transformed an unpredictable bottleneck into a high-velocity internal capability using a narrative-driven DMAIC framework.

# THE HIGH COST OF THE “HIDDEN FACTORY”



Probe cards are the final checkpoint for high-value sensor chips (pressure, humidity, infrared).

## AVAILABILITY

Consistently <50%. Assets sat idle in staging.

## THE HIDDEN FACTORY

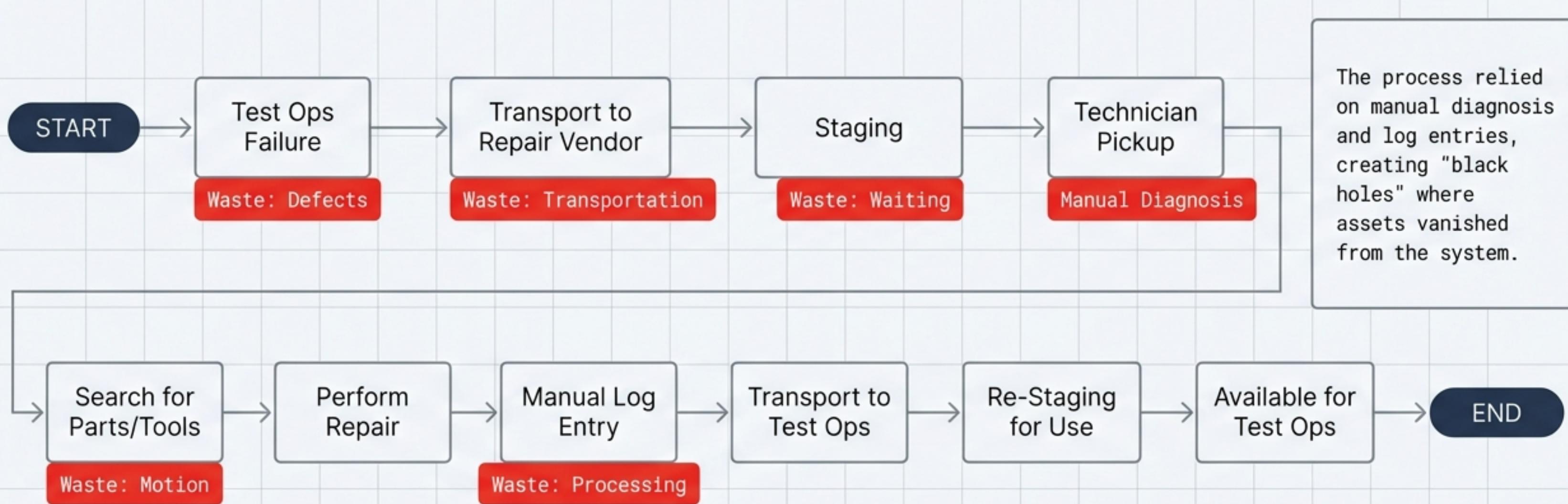
Manual paper logs created visibility black holes. Management required daily firefighting just to locate tools.

## VOICE OF THE CUSTOMER

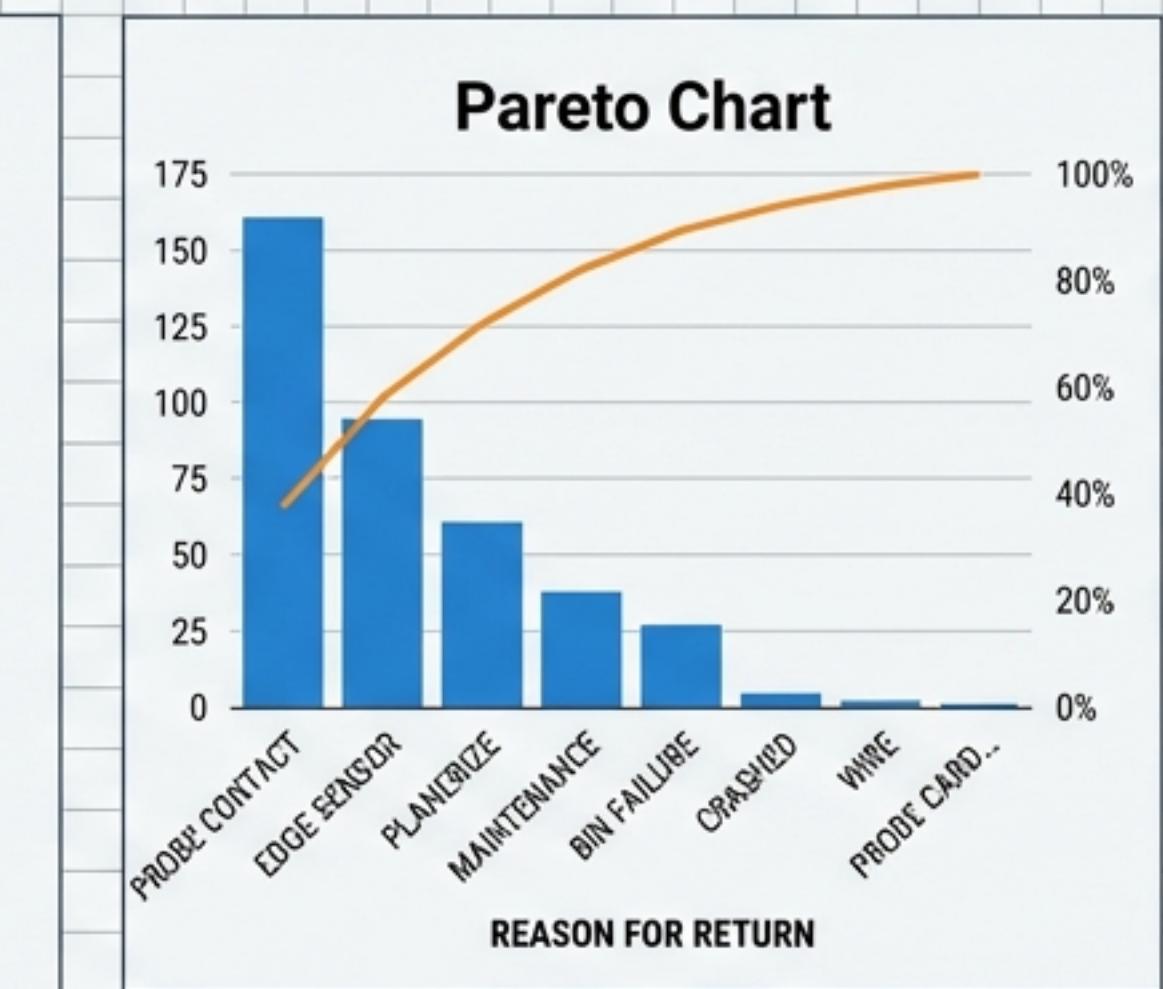
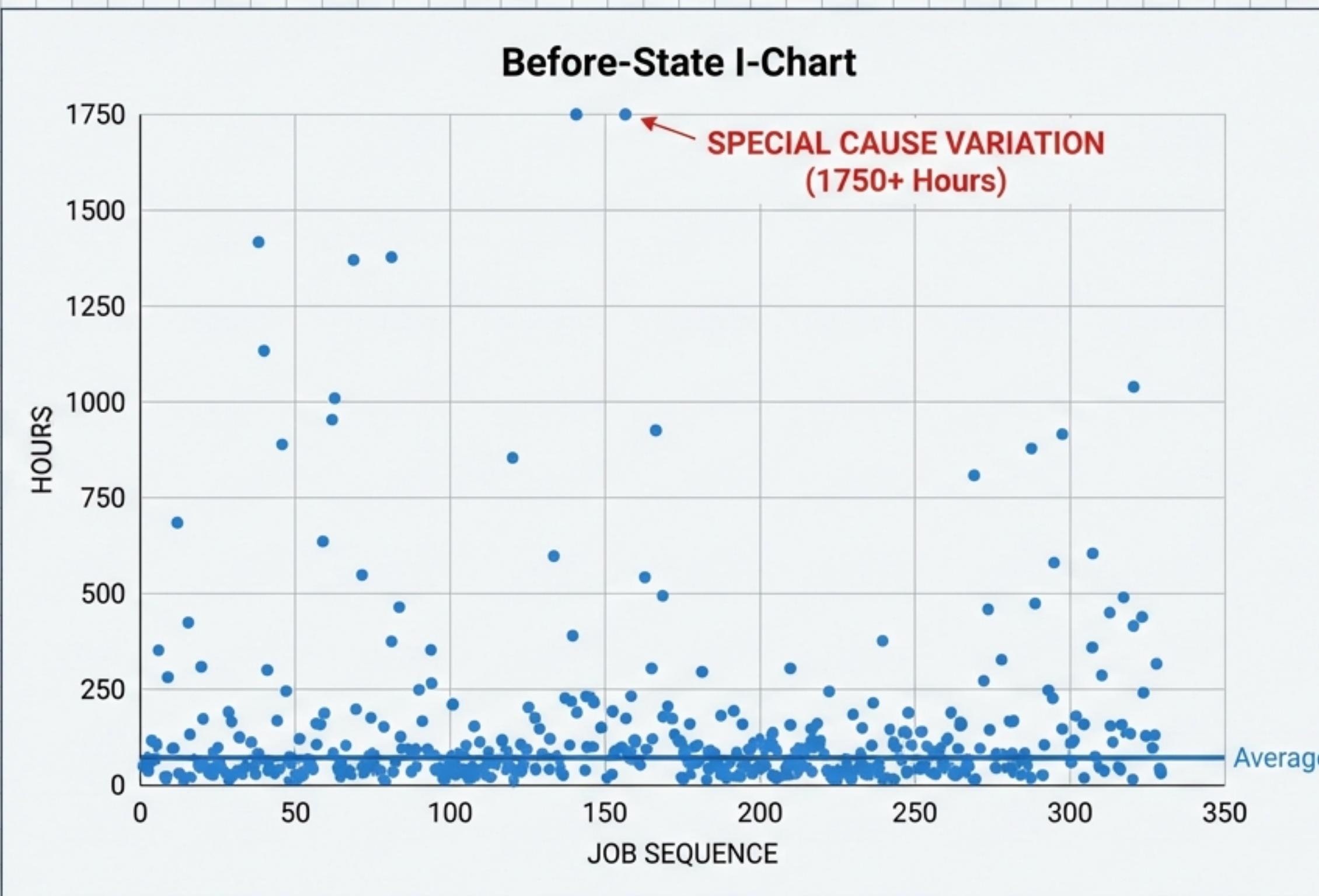
Operations requires a 48-hour turnaround. Current state: 2-4 week delays due to external vendors.

Transformed an unpredictable bottleneck into a high-velocity internal capability using a narrative-driven DMAIC framework.

# MAPPING THE CHAOS: A PROCESS DOMINATED BY WASTE



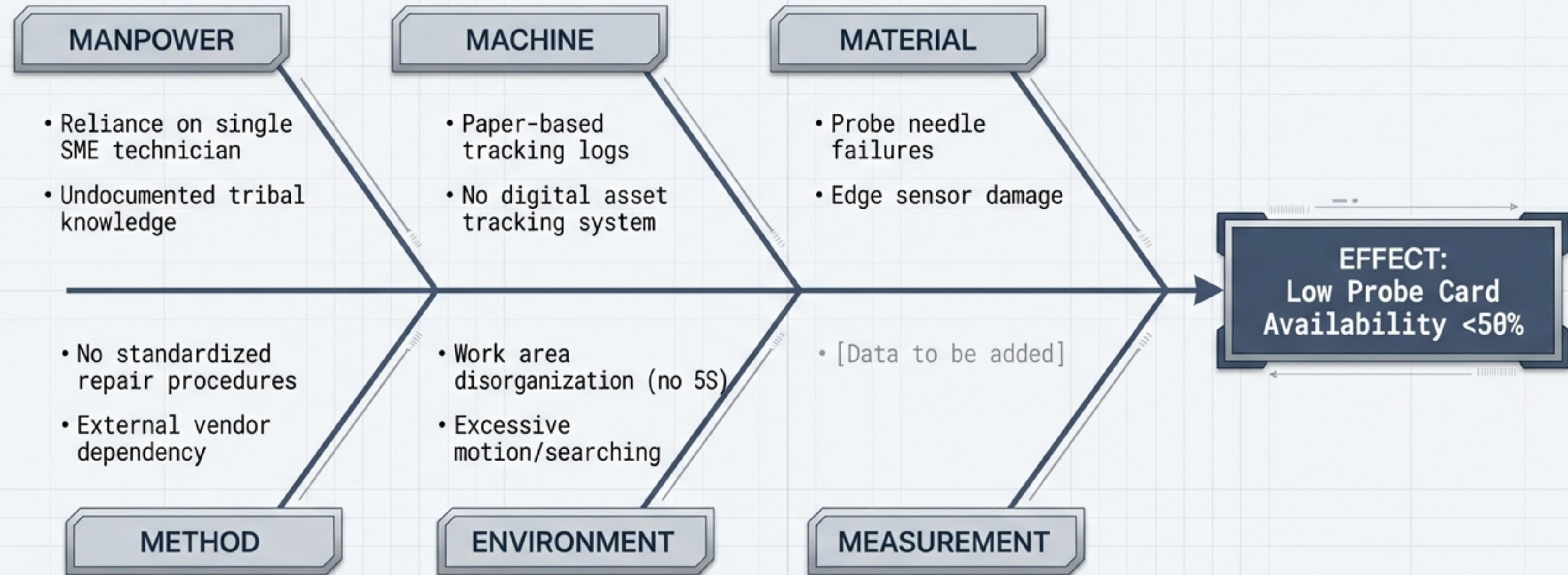
# THE DATA TRAP: WHY AVERAGES MASKED THE CRISIS



**INSIGHT:** TRADITIONAL AVERAGES SUGGESTED STABILITY. THE I-CHART REVEALS THE TRUTH: EXTREME VOLATILITY AND SPECIAL-CAUSE VARIATION RULED THE FLOOR. YOU CANNOT IMPROVE WHAT IS NOT STABLE.

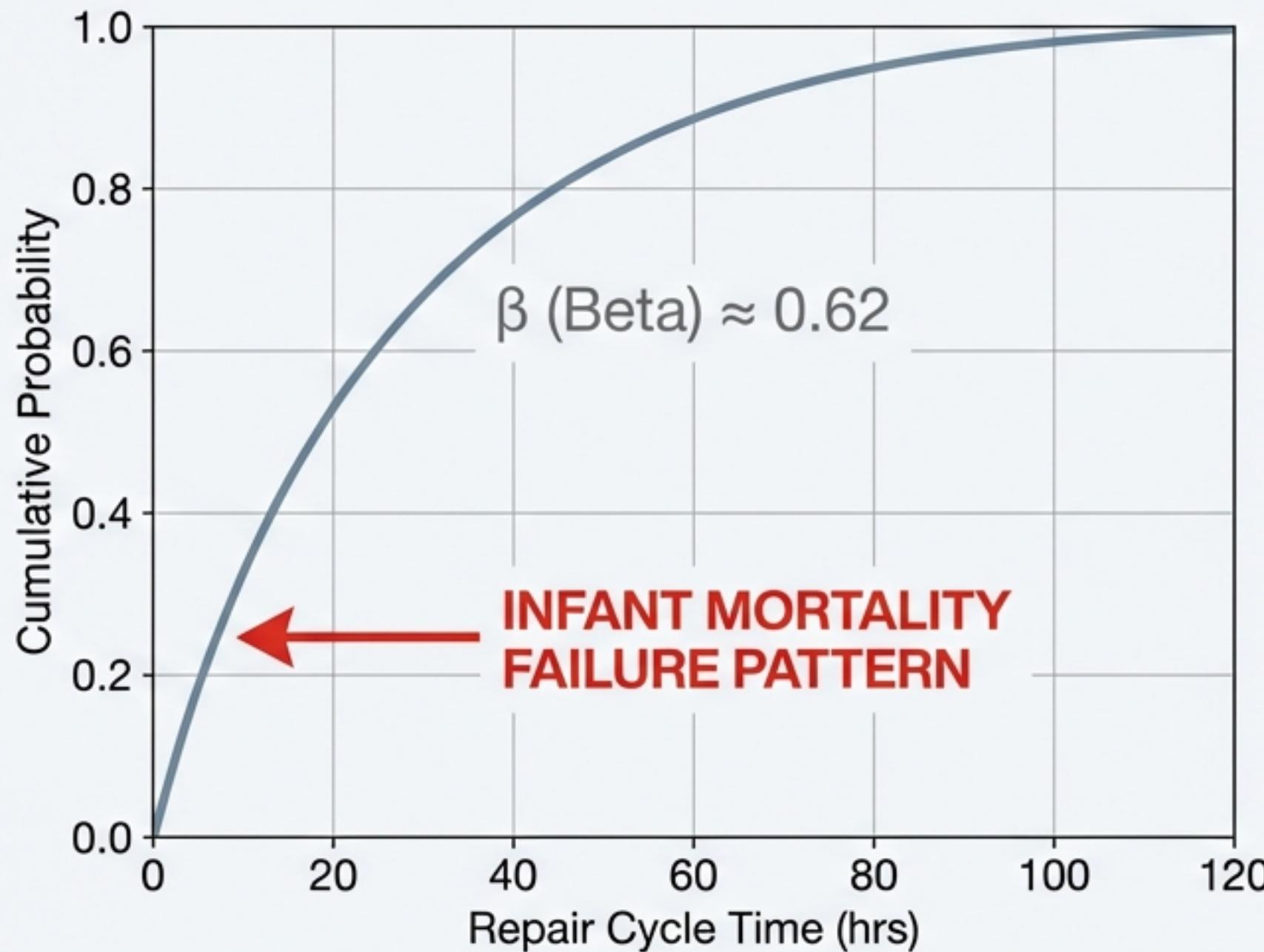
Transformed an unpredictable bottleneck into a high-velocity internal capability using a narrative-driven DMAIC framework.

# ROOT CAUSE ANALYSIS: A SYSTEMIC BREAKDOWN



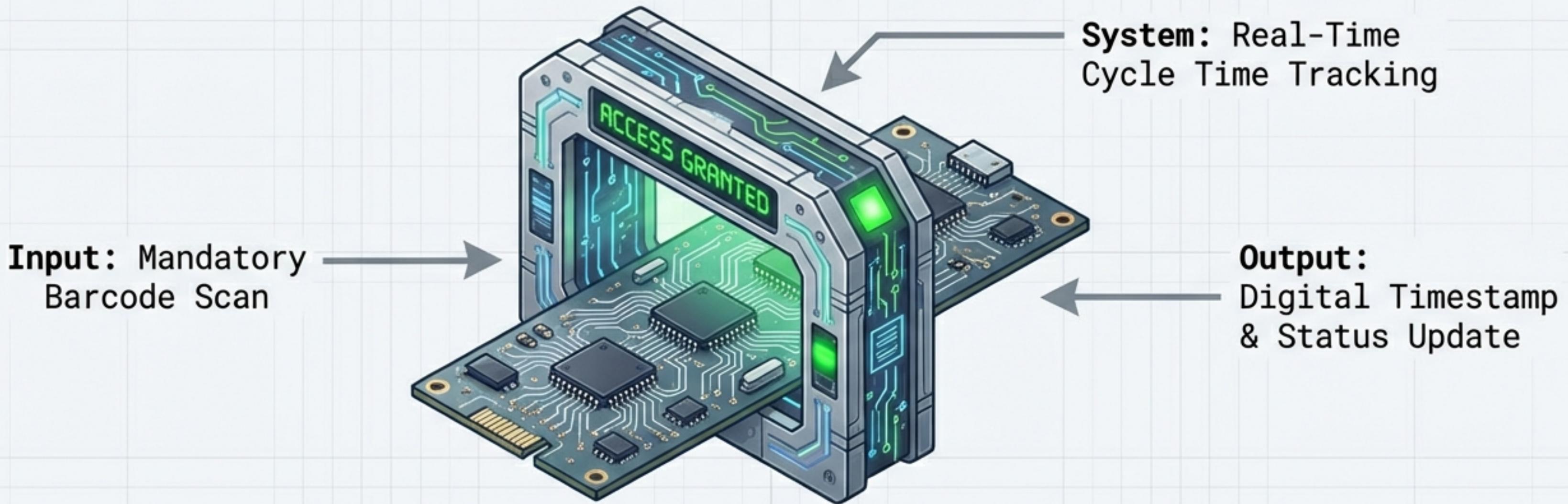
The root cause was a systemic lack of visibility and standardization, not a specific tool failure.

# STATISTICAL FORENSICS: THE EVIDENCE OF “INFANT MORTALITY”



- **The Metric:** Shape Parameter Beta  $< 1$ .
- **The Translation:** Repairs were failing immediately upon return to the line.
- **The Conclusion:** The issue is not just “tracking.” It is inconsistent execution and lack of verification steps.

# SOLUTION PILLAR 1: DIGITAL ASSET GOVERNANCE (PACMAN)



Replacing paper logs with the PACMAN system. This functions as a Poka-Yoke (Mistake Proofing) mechanism that structurally prevents an asset from moving to the next step without a digital timestamp. The 'Black Hole' is closed.

# SOLUTION PILLAR 2: INSTITUTIONALIZING TRIBAL KNOWLEDGE

## CURRENT STATE: ART



- Dependency on one Subject Matter Expert (SME).
- Undocumented methods.



## FUTURE STATE: SCIENCE



- Codified Specs: 237-0095-267
- Certification Checklist: 236-0049-001
- Embedded Verification Steps

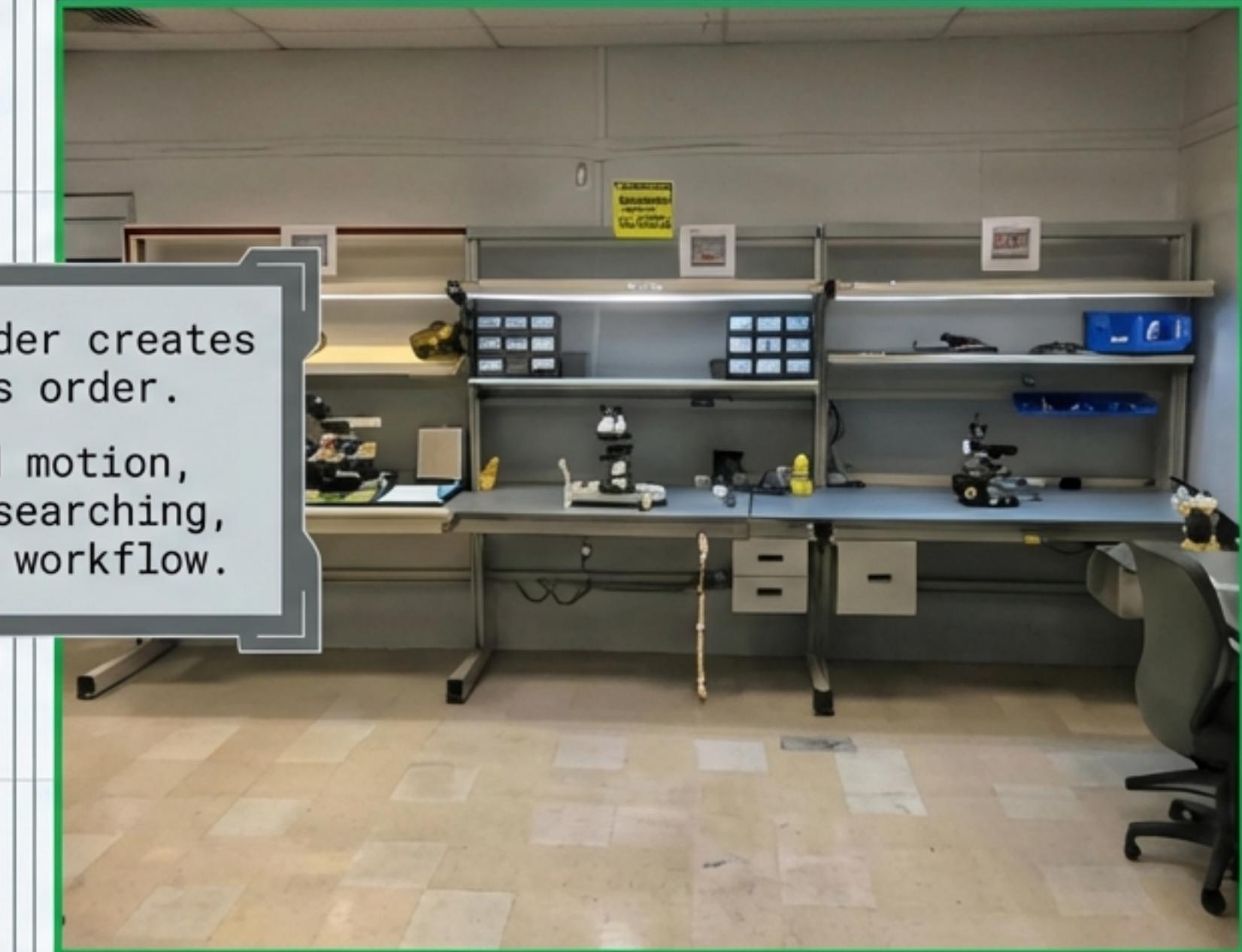
Shifted from technician-dependent execution to a repeatable, documented science.

# SOLUTION PILLAR 3: PHYSICAL TRANSFORMATION (5S)

BEFORE: Clutter & Confusion



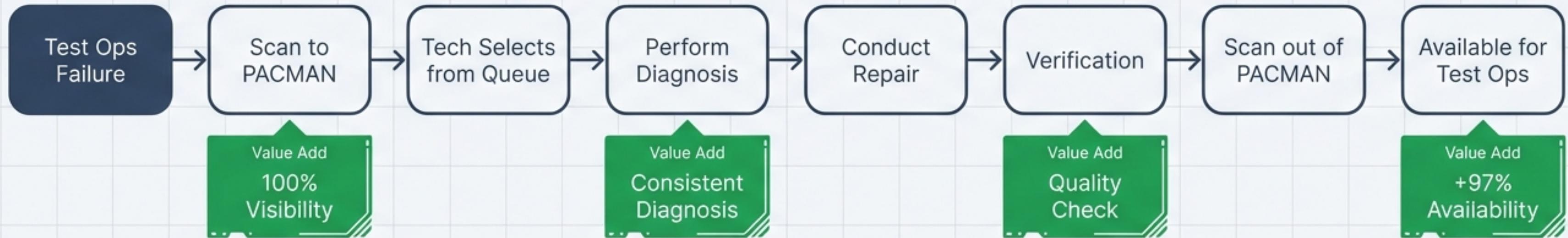
AFTER: Flow & Focus



Visual order creates process order.

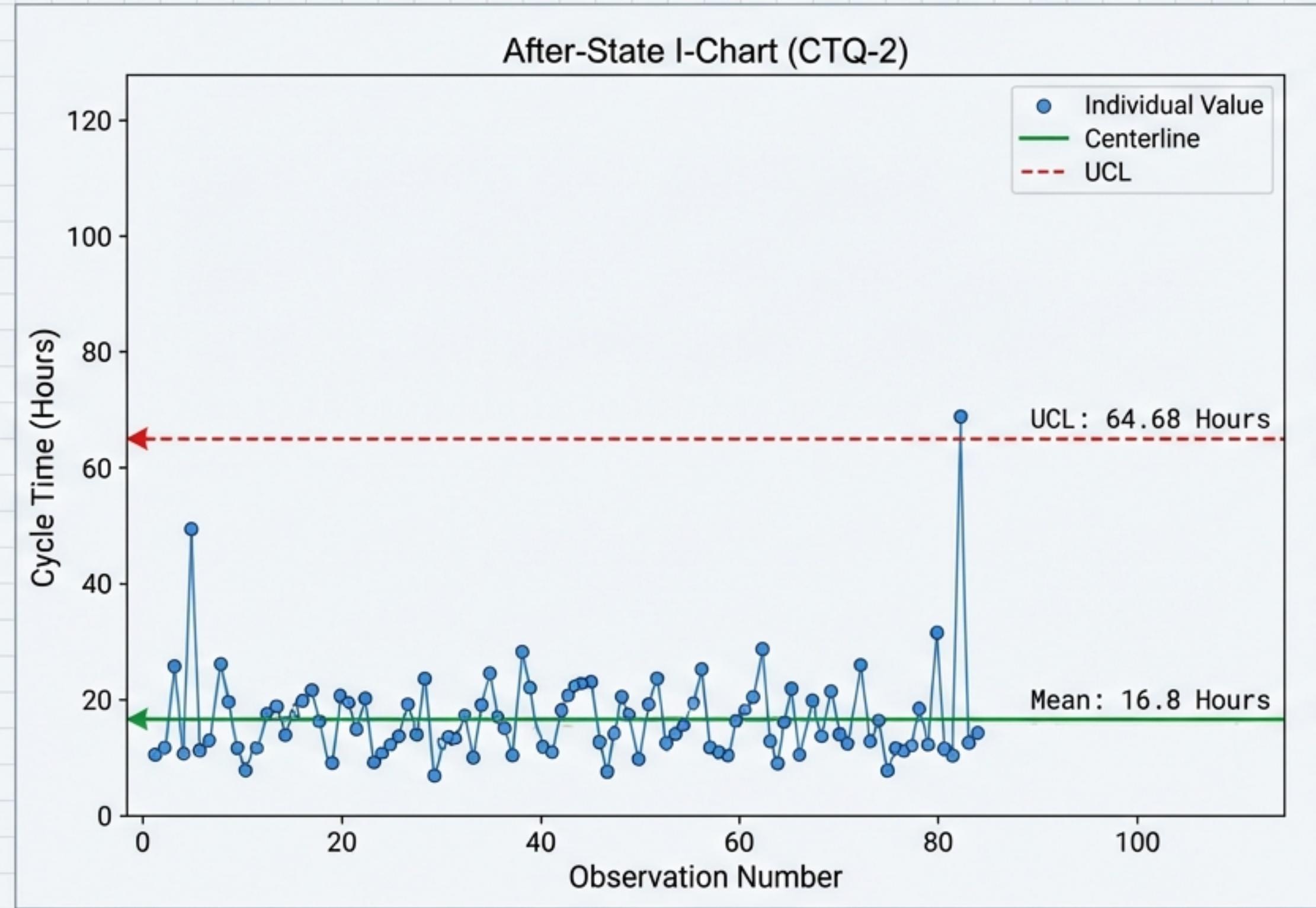
Reduced motion,  
reduced searching,  
enforced workflow.

# THE FUTURE STATE: A HIGH-VELOCITY WORKFLOW



Fewer steps, integrated quality checks, and zero dependency on external logistics.

# Validating the Improvements: Chaos Replaced by Control



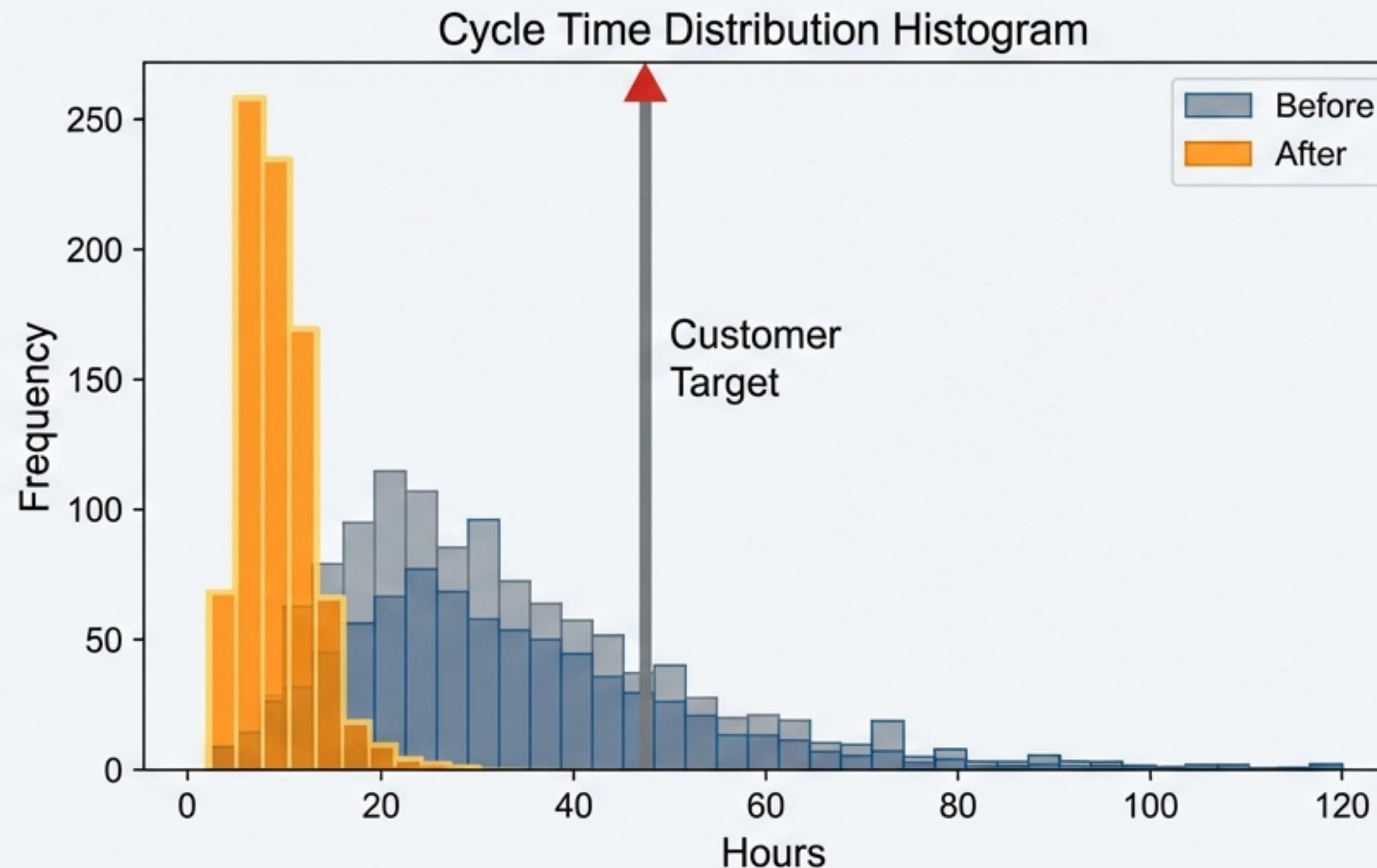
## STATISTICAL VALIDATION

Mean Cycle Time:  
Reduced **28%**  
( $23.5 \rightarrow 16.8$  hours)

Statistical Significance:  
p-value **0.00038**  
(Welch t-test)

The process is now  
predictable. Special  
causes have been  
identified and reduced.

# Shifting the Curve: Performance Distribution



## DATA SUMMARY

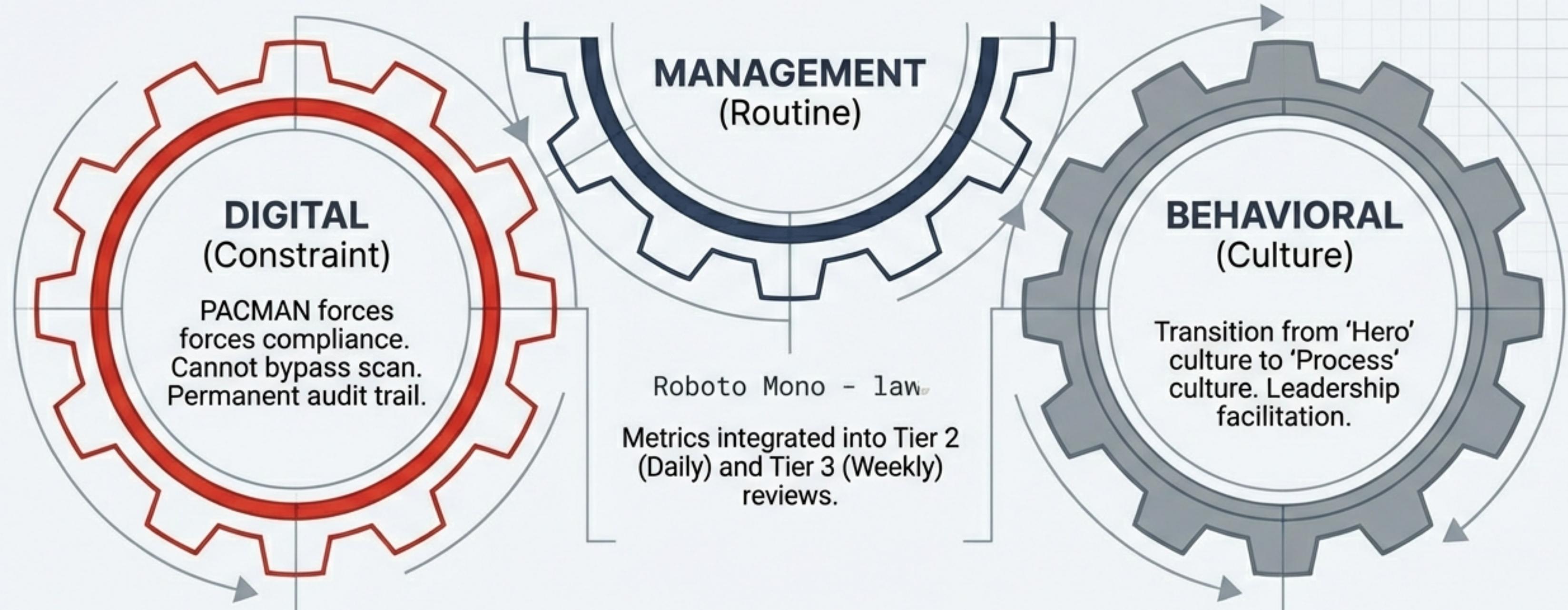
Standard Deviation:  
Reduced to 21.50 hrs

% Within 48-hr Target:  
Improved to 89.8%

**Takeaway: We didn't just  
get faster; we got  
consistent.**



# The Control Plan: Locking in the Gains



**Reaction Plan:** Defined owners for every metric with specific escalation protocols.

# Results & Strategic Impact

**\$1.06  
Million**  
(Cost Avoidance)

**97%**  
(Availability –  
Bottleneck Broken)

**<17  
Hours**  
(Average Repair Time)

- ✓ Removed the #1 constraint to on-time delivery.
- ✓ Converted undocumented tribal knowledge into enterprise assets.
- ✓ Scalability: Solution architecture ready for horizontal deployment.

*A systemic transformation from chaos to control.*