

OPERATING SYSTEM FOR REGULATED PRODUCTION

Standard Work 2.0™: Engineering the Human-in-the-Loop AI Strategy

Translating Lean Principles to Eliminate the "Hidden Factory" of Digital Waste

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A Subscription Is Not a Strategy

*"Unstructured AI adoption without standardized operational workflows doesn't eliminate waste—it **accelerates** it."*

Tool Proliferation vs. Process Standardization

Software licenses cannot fix broken handoffs or undefined data borders.

The Digital Overproduction Trap

Generative AI without operational gates floods systems with unverified data.

The **Not-so-New** Standard Work Solution

Hardwire governance into the workflow before introducing automated LLM tooling.

The Hidden Factory in Regulated Production



01 // EFFICIENCY

Manual Tax

15–20% of factory capacity is silently eroded by duplicate data entry, offline spreadsheets, and manual re-keying.



02 // COUPLING

The O-Ring or *Value-Stream Chain* *Risk (VSCR)*

Flawless physical machining fails when administrative handoffs between sales, engineering, and quality break down.



03 // RETENTION

Unwritten SOPs

Process controls live in the heads of senior operators rather than in version-controlled digital systems.

Mapping the Six Signals of Digital Waste to Traditional Lean

01

Friction → Motion

Through manual re-entry across disconnected systems.

02

Handoff Loss → Transportation

Context loss via imperfect communication channels.

03

Workarounds → Overprocessing

Via unapproved shadow IT spreadsheets.

04

Redundancy → Rework

Through duplicate data entry causing scrap.

05

Overproduction → Inventory

By generating digital paperwork without downstream pull.

06

Misalignment → Unused Talent

As skilled engineers spend hours on administrative entry.

The Paperclip Maximizer in Factory Operations



Un-Gated Generative AI

Uncontrolled Digital Overproduction

AI agents generate mountains of unreviewed documentation and runaway emails, causing severe administrative backlog—the digital equivalent of overproducing physical work-in-progress.



Standard Work 2.0™ Governance

Pull-Based Digital Execution

AI models are bound by strict staging gates, generating artifacts only when triggered by downstream operational pull. This results in zero digital WIP and instant administrative velocity.

Selective Amplification vs. Digital Noise



THE MODEL

The Hearing Aid Model

Instead, adopt the Hearing Aid Model for selective amplification of operational data, filtering out background noise to surface critical signals.

Polanyi's Paradox

The Cognitive Bottleneck

"We know more than we can tell."

When applying automation to the shop floor, AI often acts as a noisy channel. It strictly requires the human operator's tacit knowledge to accurately interpret the complex frequencies of shop-floor reality.

Without this essential human context, automated systems fail to capture the nuanced, unwritten rules of production.

FADE vs. RISE: The 3C Protocol & Human API

MACHINE SCOPE • AUTOMATED EXECUTION

80% FADE

Depreciating Routine Capabilities

- **F – Familiar Pattern Recognition:** Spotting routine data anomalies & categories
- **A – Assembling Information:** Compiling & summarizing data across IT/OT systems
- **D – Doing Procedures:** Executing step-by-step administrative rules & draft travelers
- **E – Encyclopedic Memory:** Instantly retrieving drawing revisions, specs & manuals

STATUS: SANDBOXED / **READ-ONLY** (No direct database write-privileges)

HUMAN CONTROL • TECHNICAL GOVERNANCE

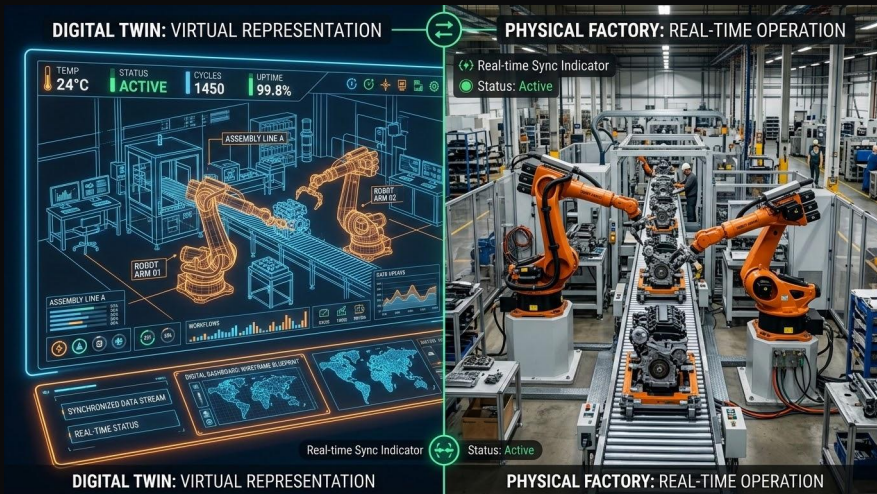
20% RISE

Appreciating Human Capabilities

- **R – Reasoning Under Uncertainty:** High-stakes judgment on ambiguous edge cases
- **I – Imagination:** Creative problem-solving & reframing shop-floor bottlenecks
- **S – Social Connection:** Building trust, empathy & cross-functional leadership
- **E – Explaining Meaning:** Translating complex operational events into action

3C PROTOCOL: **Capture:** Desired Raw Signals → **Communicate:** Structured Prompts → **Check:** Human API Staging Gate

DATA GOVERNANCE & DIGITAL TWINS



01 / Process Visibility

Utilize a "Digital Twin" workspace to achieve complete, real-time process visibility in 1-click, preventing active operational disruption.

02 / Separation of Powers

Isolate R&D from production environments. This strategic separation establishes new onshoring operations securely without active floor disruption.

03 / Document & Data Control

Enforce AI configuration management, and deploy strict policies and procedures for programmatic containment of technical data. Use this as a primary boundary and source for your digital partners (thou shalt not...).

PROCESS VISIBILITY // SYSTEM STATE

Active workspace integration minimizes transition latency and prevents downstream disruption.

Adapting Industrial Safety PL to AI Prompts

Physical Safety (ISO 13849-1)

- Physical Machine Guarding
- Emergency Stop (E-Stop)
- Interlock Switches
- Preventative Calibration

Digital Safety (Standard Work 2.0™)

- Prompt Boundary Constraints
- Instant Model Halted Circuit
- Dual-Run Verification Gates
- Weekly Model Drift Audits



Core Takeaway

"Treat AI prompt drift with the exact same engineering discipline and safety performance levels (PL) as physical machine guarding on the shop floor."

Active Monitoring & CUI/ITAR Data Enclaves



STEP 01

Primary Model

Primary Operational Model executes daily task prompts and compiles workflows.



STEP 02 / MONITOR

AI Whistleblower

The "AI Whistleblower" (Redundant Monitor Model). A secondary, zero-temperature model running continuous behavioral scrutiny on primary outputs.



STEP 03

"Blue Hold" Circuit

The "Blue Hold" Circuit Breaker. Halts execution if prompt drift or unauthorized write commands occur.



STEP 04

Agentic "Human" Firewall

Agentic Firewall. Enforces hard data borders blocking autonomous LLM access in ITAR and CUI environments.

The Digital Calibrator & Friday Morning Gemba

ROLE SPECIFICATION

The 10% Engineering Allocation

Allocate **4 hours/week** of a Manufacturing Engineer as a **Digital Calibrator**.

This role functions to maintain prompt templates and audit model drift, treating digital tools with the same precision as physical CNC tooling.

Friday Morning Action Plan

01

Map the Hidden Factory via a Gemba walk focused on administrative re-entry.

02

Define the 80/20 Boundary to isolate automation from human gates.

03

Build the Digital Safety Circuit using 3C staging templates before deploying AI.

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Standard Work 2.0™

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<https://standardwork2.com>