Manufacturing Empathy: Sensorial AI for Rewriting Human-AI Collaboration

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Event: 53rd SME North American Manufacturing Research Conference
Blue Sky Competition and the SME David Dornfeld Manufacturing Vision Award

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Manufacturing's Two Flawed Futures

We face a critical choice

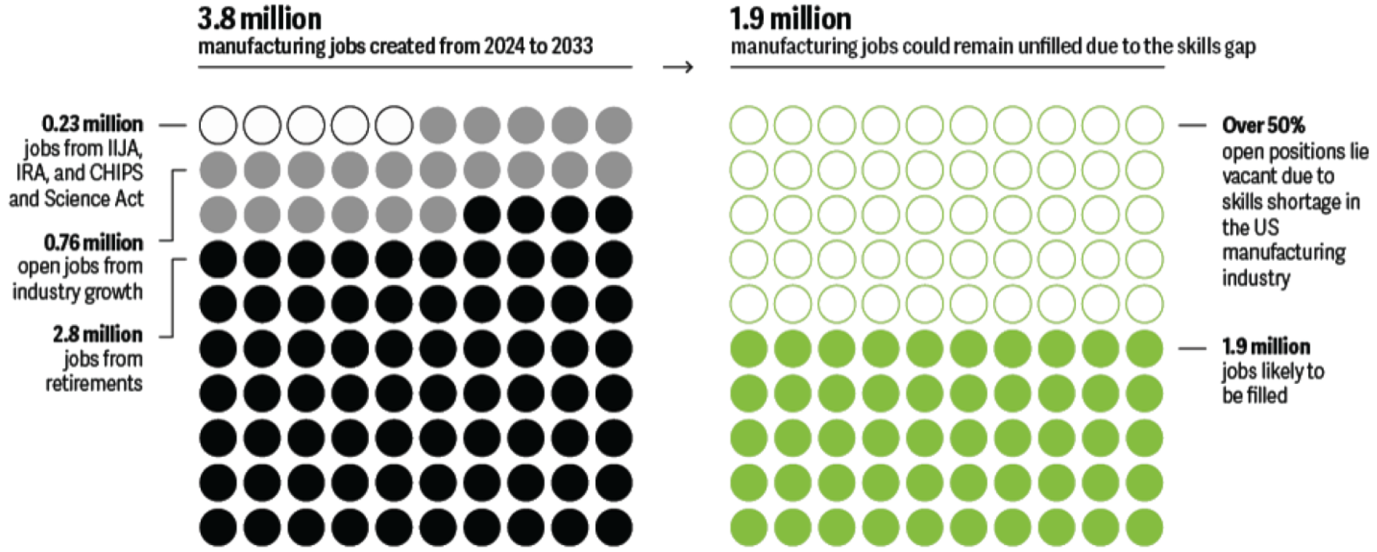
Total Automation

Current Reality

Dark Factories

The Flawed Human-in-the-Loop

The True Threat: A Looming Workforce Collapse



Aging Workforce

Skills Gap

Perception & Image

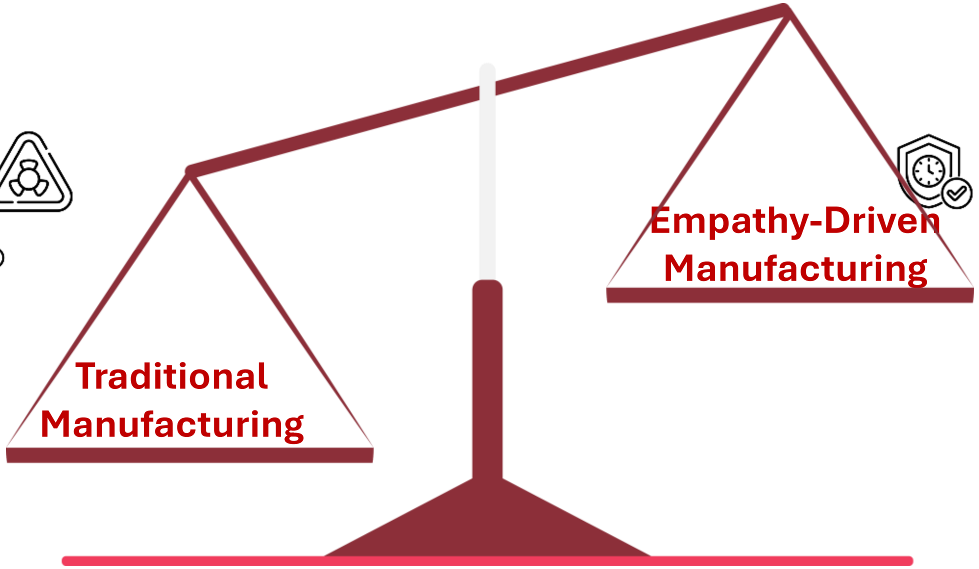
Globalization & Offshoring

The Empathy Gap: We Can't Fix What We Don't Measure

Missed Safety Hazards
(Incidents & Injuries)

Unnoticed Worker Fatigue
(Rework)

Rigid Automation
(Errors & Downtime)

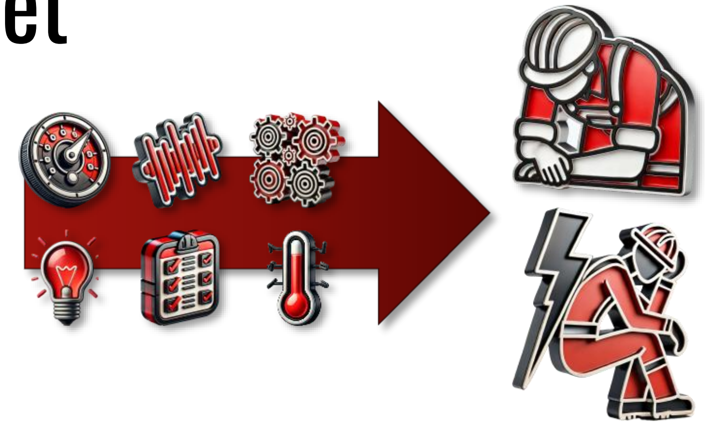


Real-Time Safety

Stress Detection

Flexible Collaboration

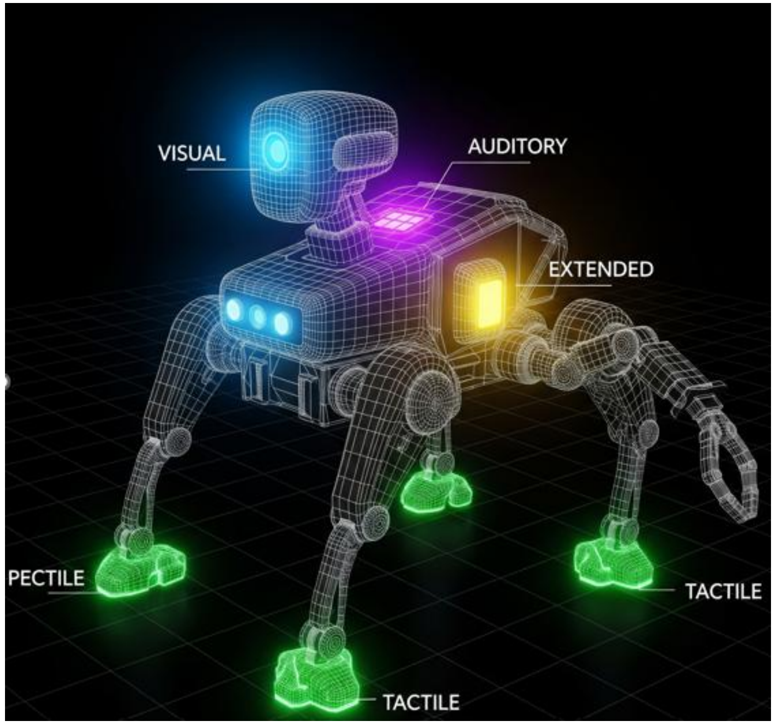
Our Proposal: Make Empathy a Quantifiable Asset



We propose a revolutionary shift: treat manufacturing empathy as both a **quantifiable resource** and a **strategic asset**.

The Technology: Multi-Modal Sensorial AI

- **VISUAL PERCEPTION:**
  High-Resolution Optical & Thermal Systems
- **AUDITORY ACUITY:**
  Directional Microphones & Vocal Stress Analysis
- **TACTILE SENSITIVITY:**
  Multi-Array Pressure & Thermal Sensors
- **EXTENDED SENSING:**
  Chemical & Particulate Analyzers



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Our Platform in Action: From Synchronization to Collaboration

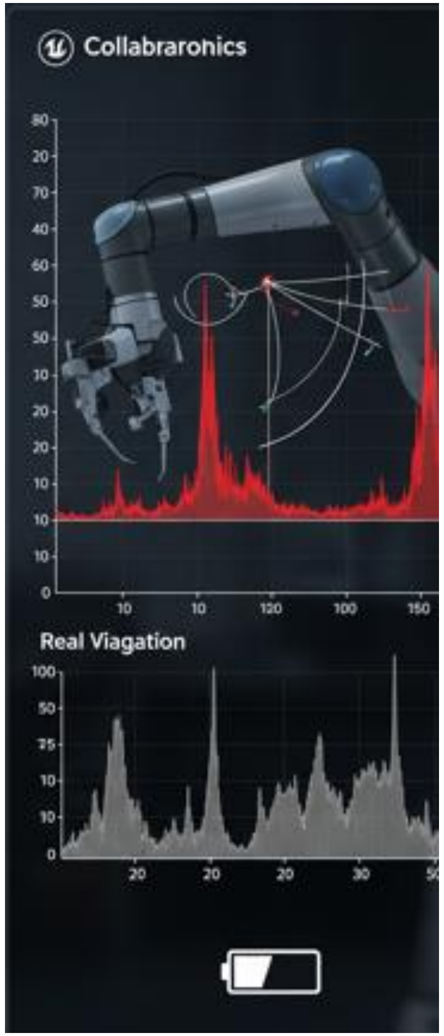
Proof of Concept: Real-Time Kinematic Mapping

Application: Collaborative Task Workflow

The Key Innovation: The Robot as the Ultimate Sensor

Quantifying Ergonomics:
Robot joint angles provide a perfect, objective model for physical stress, replacing subjective surveys.

Quantifying Fatigue:
The robot's battery consumption provides a novel, quantitative metric for how exhausting a collaborative task is.



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From Intuition to Insight: The Empathetic Response

Stage 1: Raw Data

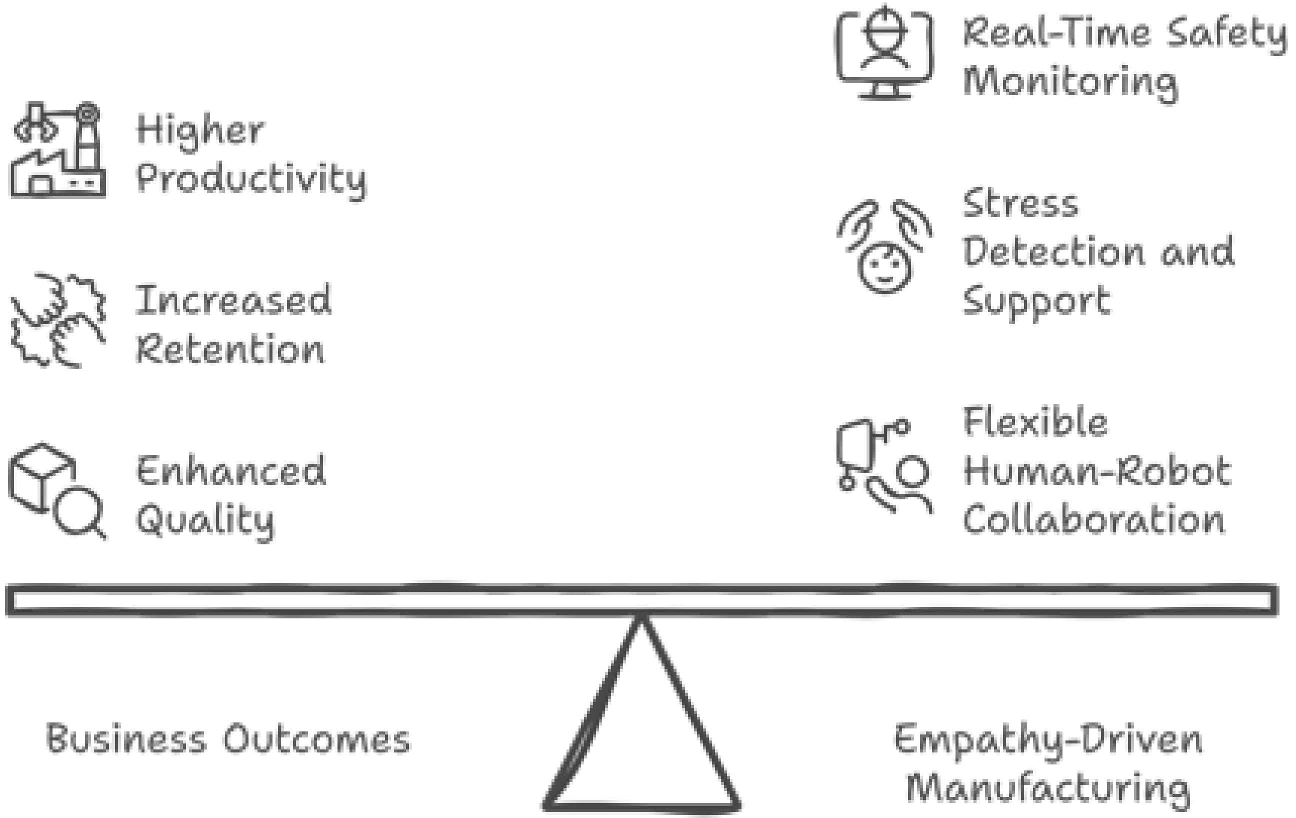
Stage 2: AI-Powered Analysis

Stage 3: Actionable Insight

Stage 4: Clear Outcome

Outcomes:
Adaptive Safety, Dynamic Task Rebalancing, Ergonomic Optimization

A Win-Win for People and Production



Balancing Business and Human-Centric Manufacturing

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Our Vision: The Sentient Workspace

Making the invisible visible: A workspace that senses and adapts to its people.

A future where automation empowers, rather than diminishes, human workers.

A future that accelerates production AND prioritizes human thriving.

A future where we unite operational performance with genuine care.

A Vision Aligned with National Priorities

Enabling Trusted AI Teaming

Securing Resilient Supply Chains

Defining the Future of Work

Ensuring Total Worker Health®

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Let's Build a More Human Future.

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