LNS Research

Market Shaping Enterprises

Competitive Advantage through Industrial Productivity, AI, & Decision Velocity

We are on a mission to empower industry leaders to transform their organizations

Our vision is a world where industrial companies are agile, autonomous, and sustainable

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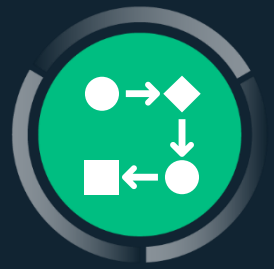
Four Industry Megatrends

Rapidly Changing Workforce



Expanding Asset & Product Complexity

Elevated Supply Uncertainty & Risk

AI is Here

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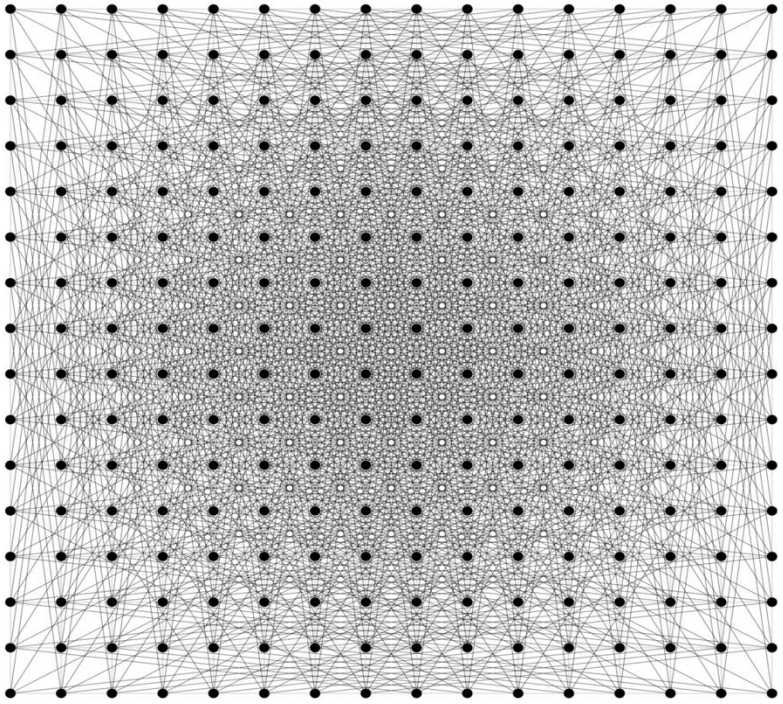
THE WALL STREET JOURNAL.

TECHNOLOGY • ARTIFICIAL INTELLIGENCE • SCIENCE OF SUCCESS

A Famous Math Problem Stumped Humans for 80 Years. AI Just Cracked It.

The math world is losing its mind over the new solution to an Erdős problem. This is what AI found, how we missed it—and why it matters.



Prompt.

Let $P \subset \mathbb{R}^2$ be a finite set of distinct points. Define

$$\nu(P) = \left| \left\{ \{p, q\} \in \binom{P}{2} : \|p - q\|_2 = 1 \right\} \right|$$

and, for each integer $n \geq 1$, $\nu(n) = \max_{\substack{P \subset \mathbb{R}^2 \\ |P|=n}} \nu(P)$.

Resolve Erdős's planar unit-distance problem completely: $\nu(n) \leq n^{1+O(1/\log\log n)}$ as $n \to \infty$?

It spit out this proof:

$$\nu(P_j) \geq n_j^{1+\delta}, \quad \delta = \frac{\gamma}{4B} > 0.$$

Given arbitrary $C_0 > 0$ and N, choose j so large that $n_j \geq N$ and $C_0/\log\log n_j < \delta$. Then

$$\nu(n_j) \geq \nu(P_j) > n_j^{1+C_0/\log\log n_j}.$$

Thus no universal constants C, N can satisfy the proposed upper bound.

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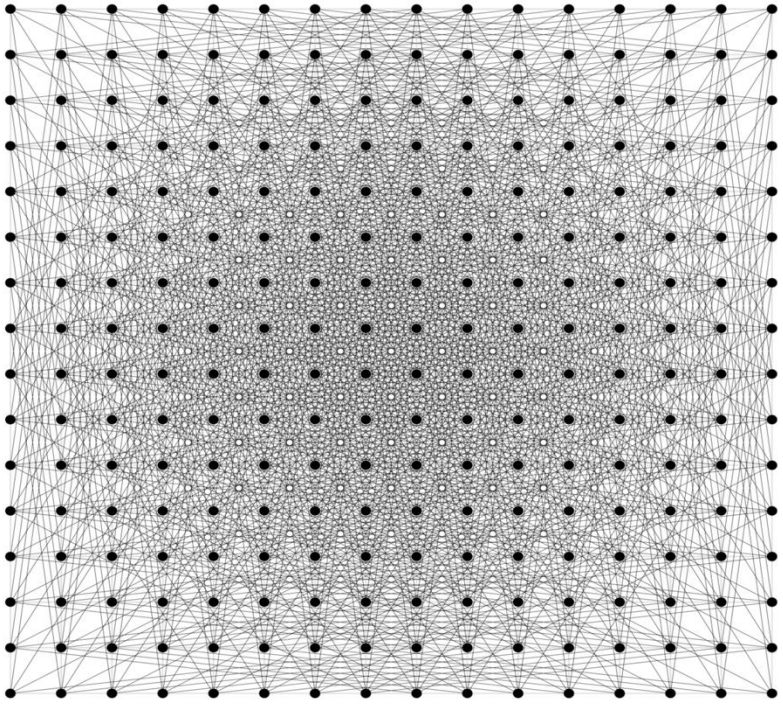

Internal Model
32 Hours | $1,000 in Tokens
75,000 Word Chain of Reasoning

The OpenAI research team, from left to right: Sebastien Bubeck, Mehtaab Sawhney, Mark Sellke, Hongxun Wu, Alex Wei and Lijie Chen. OPENAI

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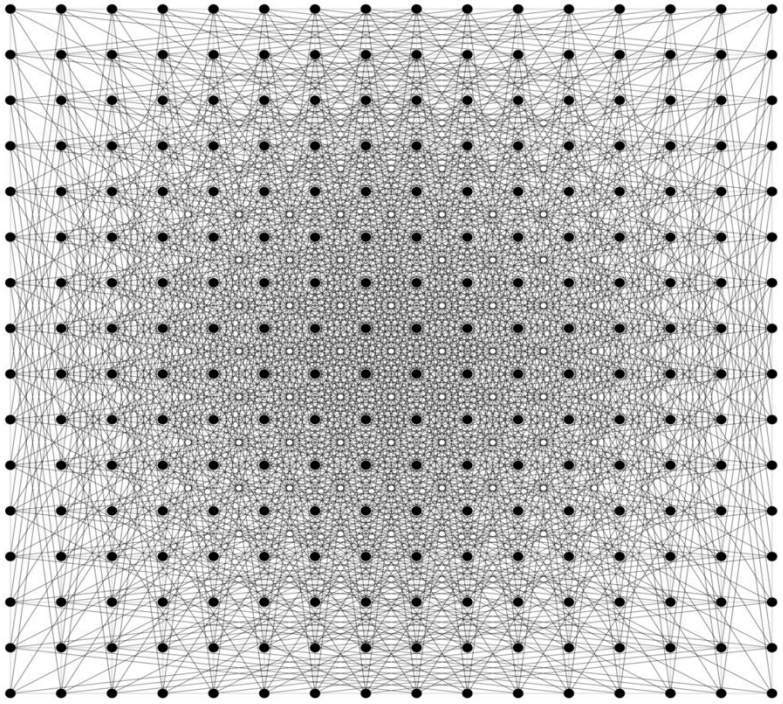

Unthinkable even a Month Ago

> "There is no doubt that the solution to the unit-distance problem is a milestone in AI mathematics: If a human had written the paper and submitted it to the Annals of Mathematics and I had been asked for a quick opinion, I would have recommended acceptance without any hesitation. No previous AI-generated proof has come close to that."
>
> — Timothy Gowers, professor, Collège de France

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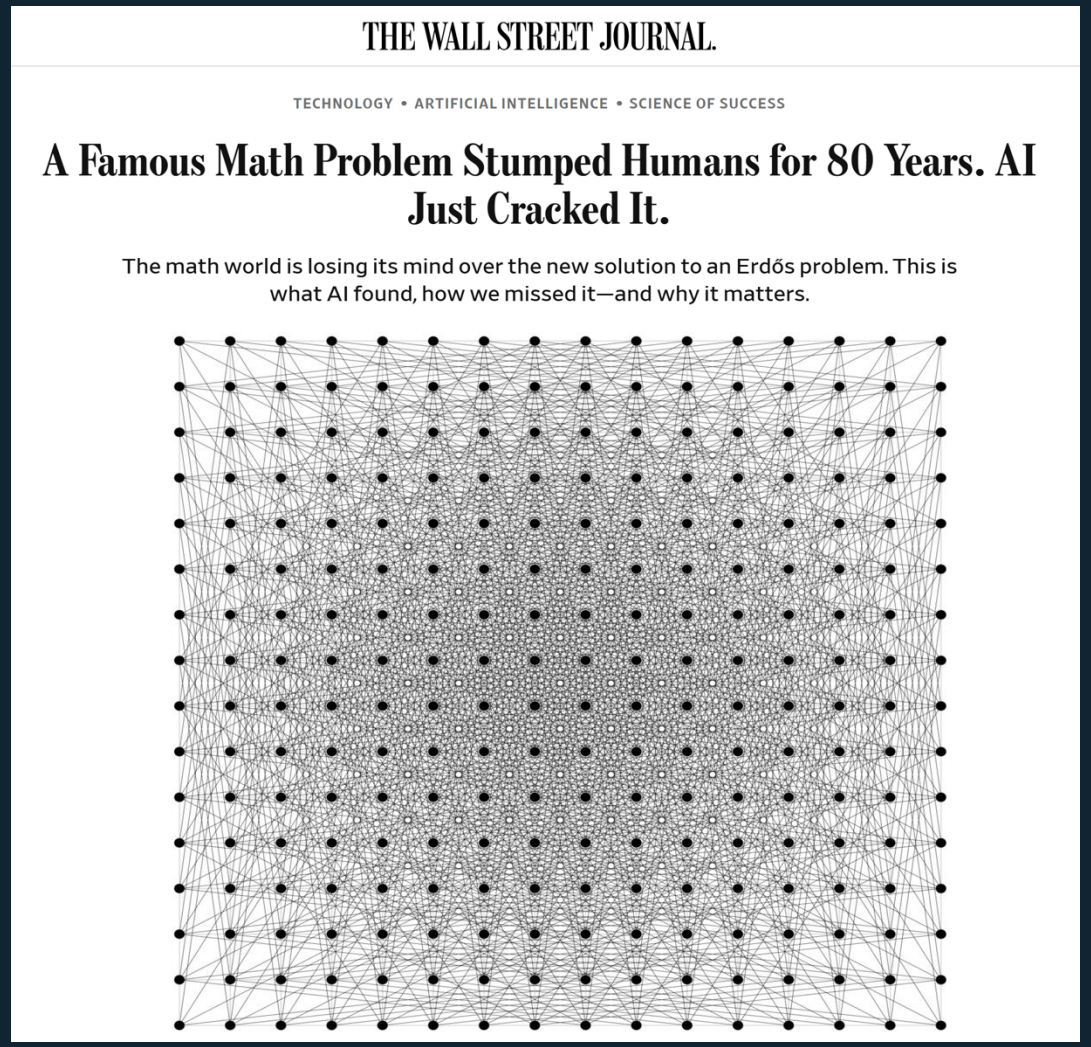

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Why AI Succeeded

- **Experimenting with Improbable Strategies**
  (Disprove instead of Prove)
- **Synthesis vs. Expertise**
  (Number Theory & Discrete Geometry)
- **Time, Attention, Patience, Focus, Persistence.**

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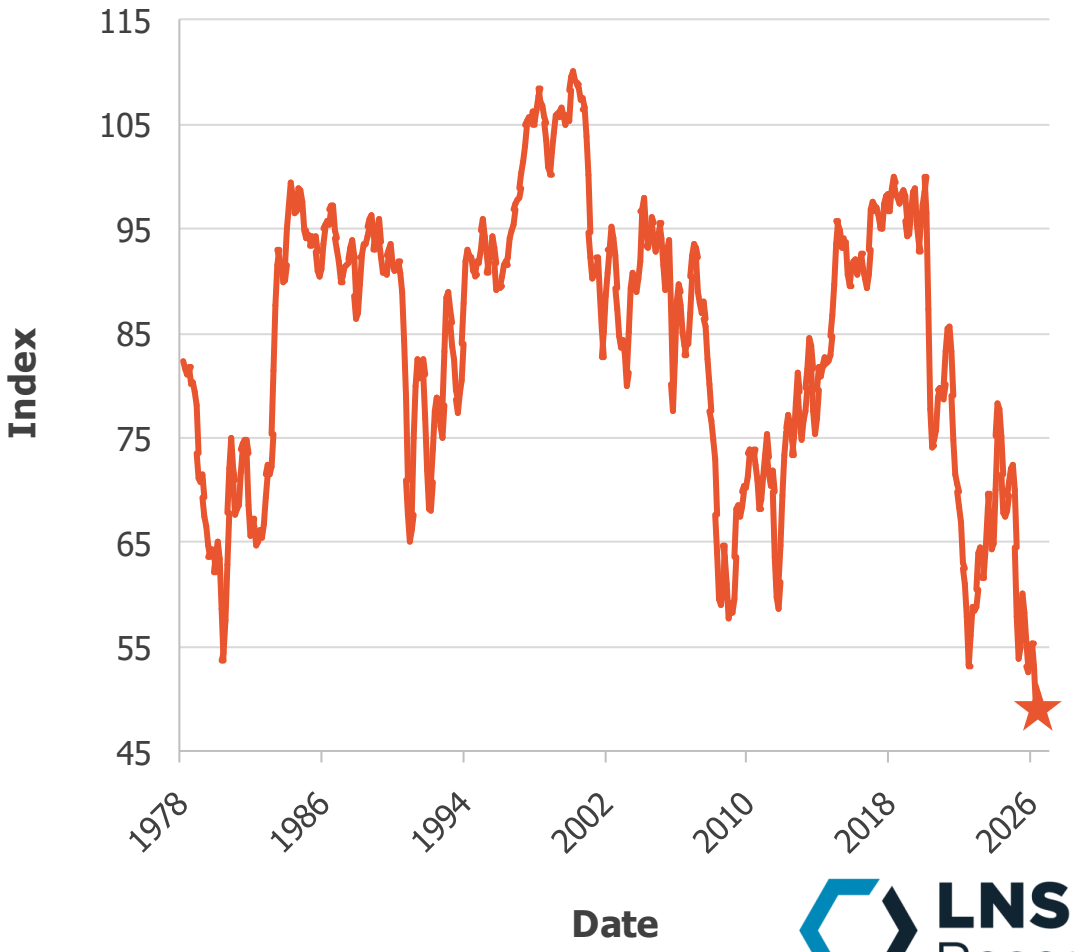
All-Time Stock Market Highs & Consumer Sentiment Lows

S&P 500 Index

University of Michigan Consumer Sentiment Index



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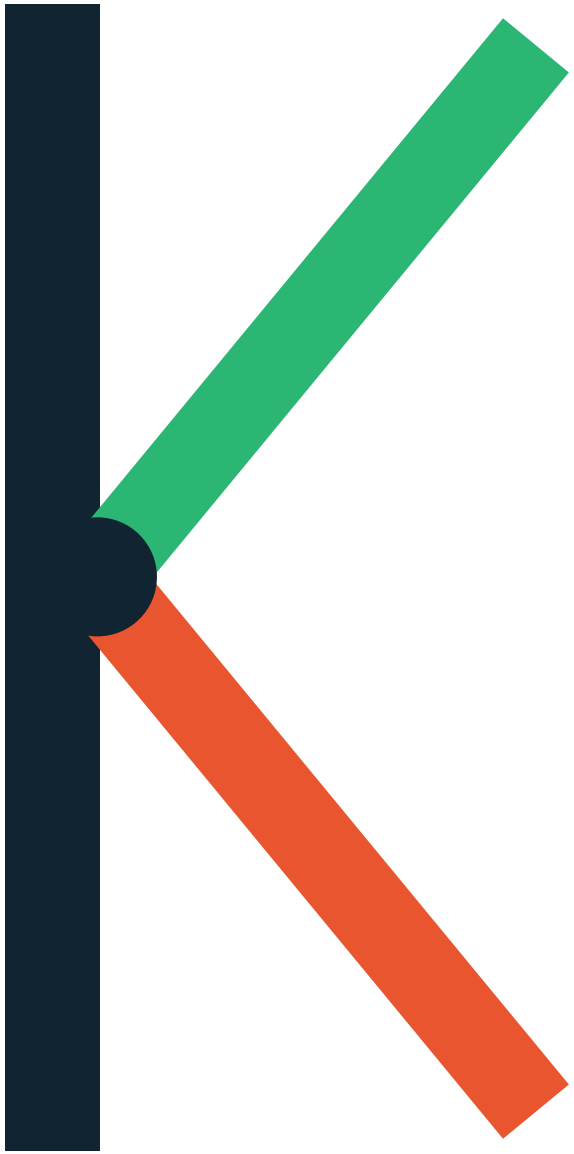
An Accelerating K-Shaped Economy???



Potential AI Winners

- AI-Embedded Companies
- Capital & Equity Holders
- AI-Empowered Execs & Experts

Potential AI Losers

- AI-Piloting Companies
- Wage-Dependent Consumers
- Managers and Routine Knowledge Workers

US Manufacturing Productivity Growth

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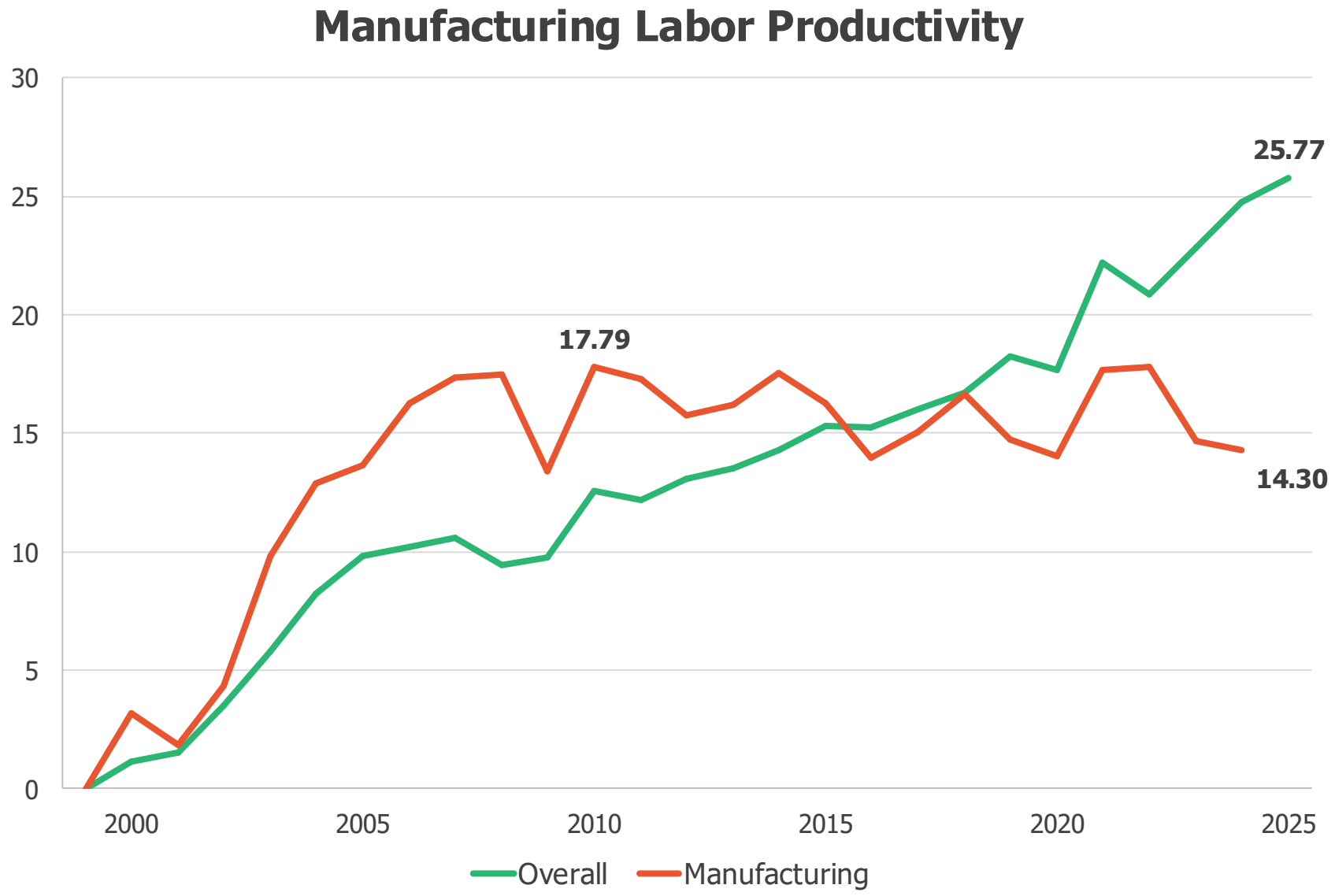
US Manufacturing Labor Productivity Peaked in 2010



Four Inputs

- Labor (Skills Mix)
- Capital Investments
- Materials, Services, Energy
- TFP (Process Improvement)

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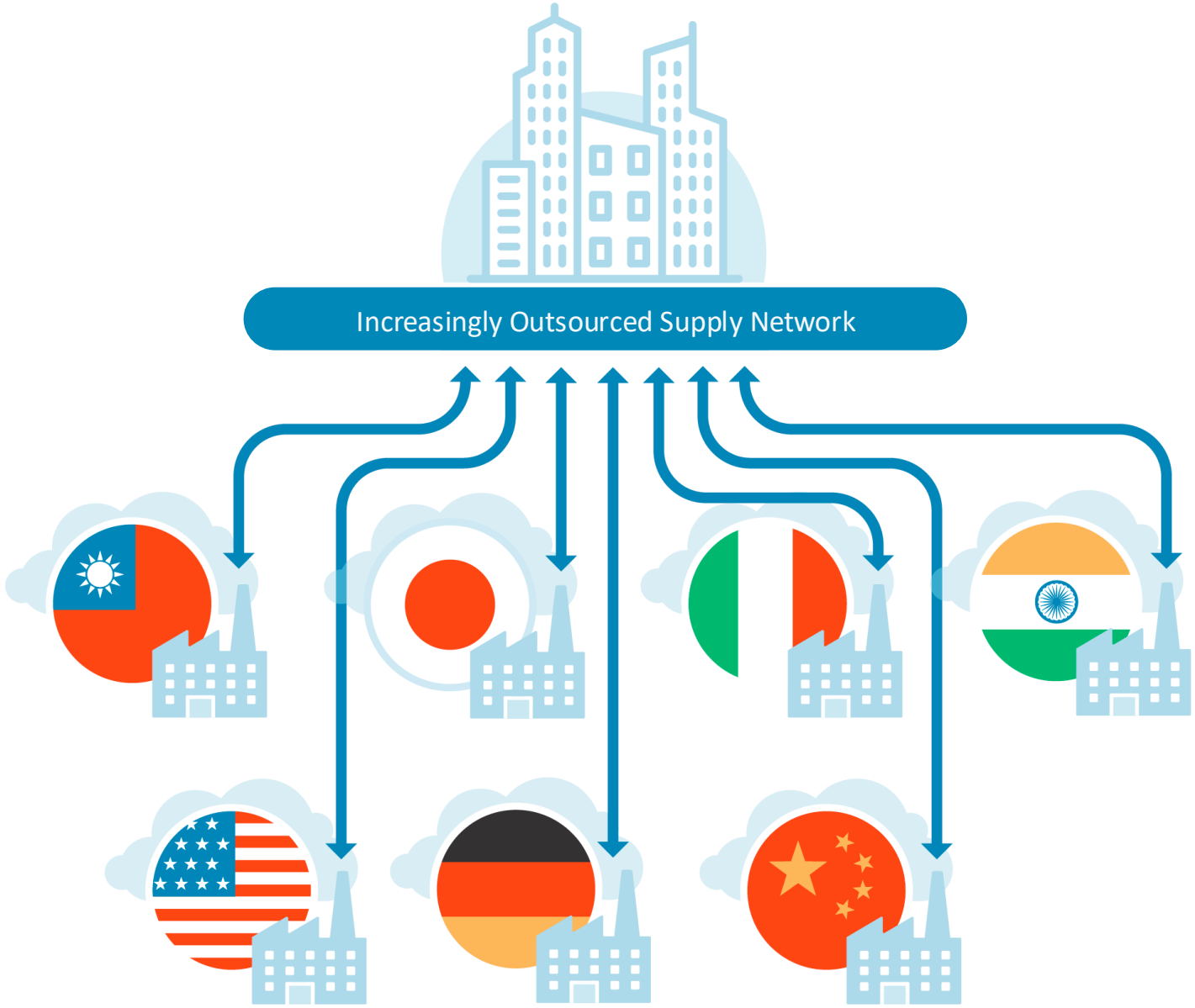
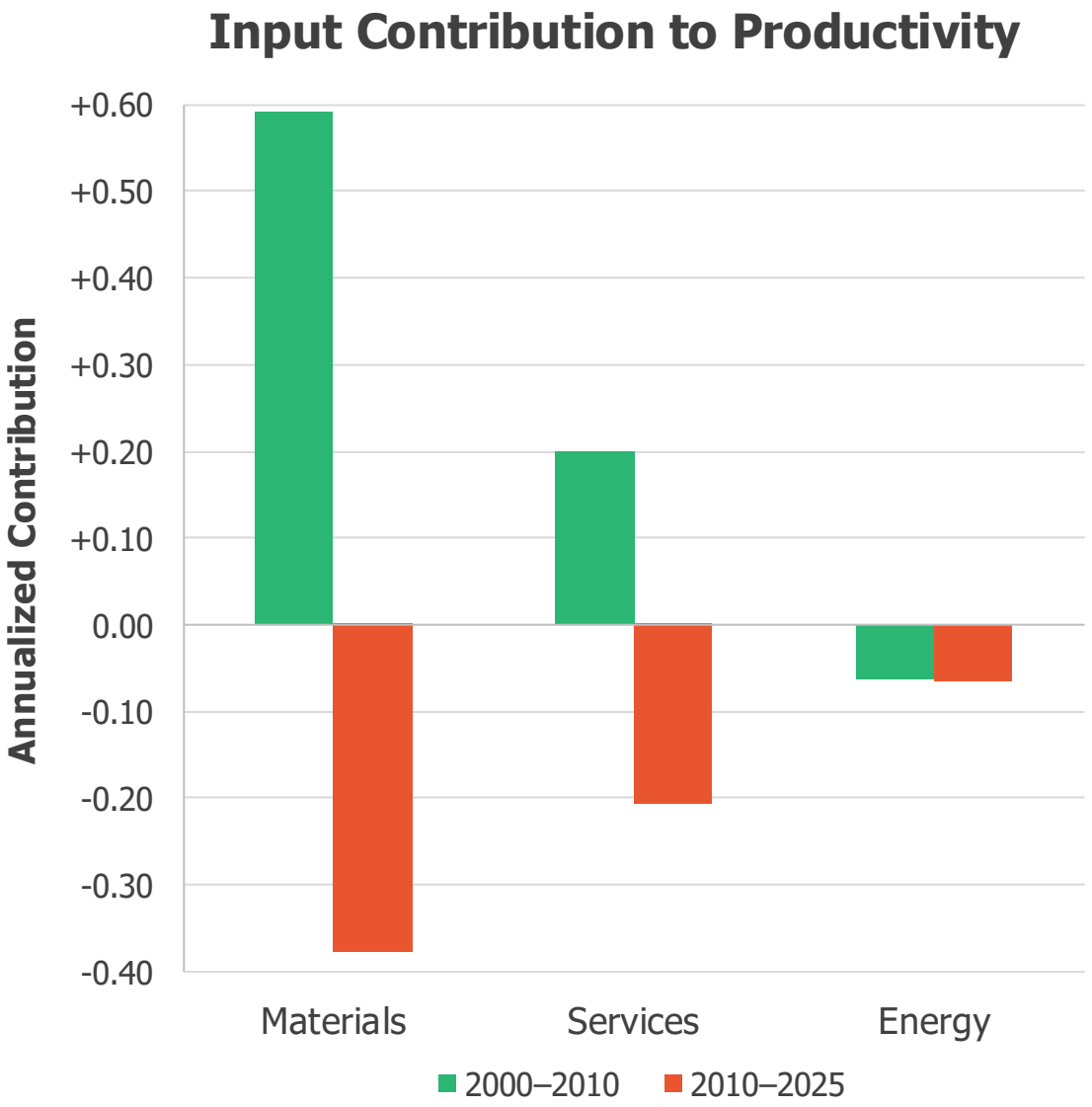
#1 Outsourcing: Uniquely Destructive to US Manufacturing

Procurement and supply chain strategies:

- **Drove short run profit.**
- **Reduced long run productivity & competitiveness.**



#1 Outsourcing: Uniquely Destructive to US Manufacturing



- **Procuring higher value components.**
- **Augmenting vs. replacing labor & internal services.**
- **Process Improvement (TFP) stalled.**
- **Productivity gains weren't recaptured.**

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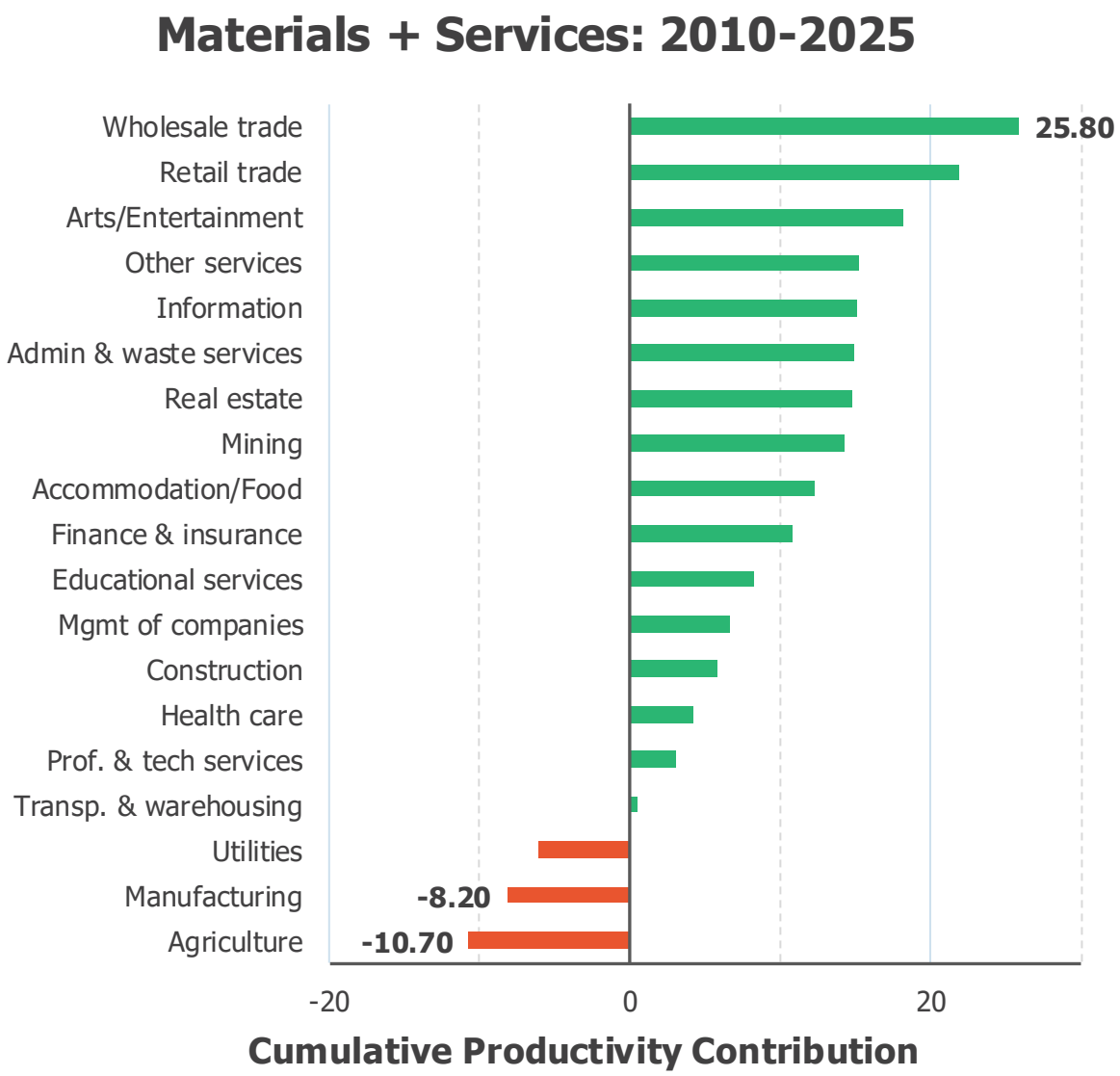
#1 Outsourcing: Uniquely Destructive to US Manufacturing



- **US Manufacturers outsourced the value chain.**
- **Other industries transformed the value chain.**

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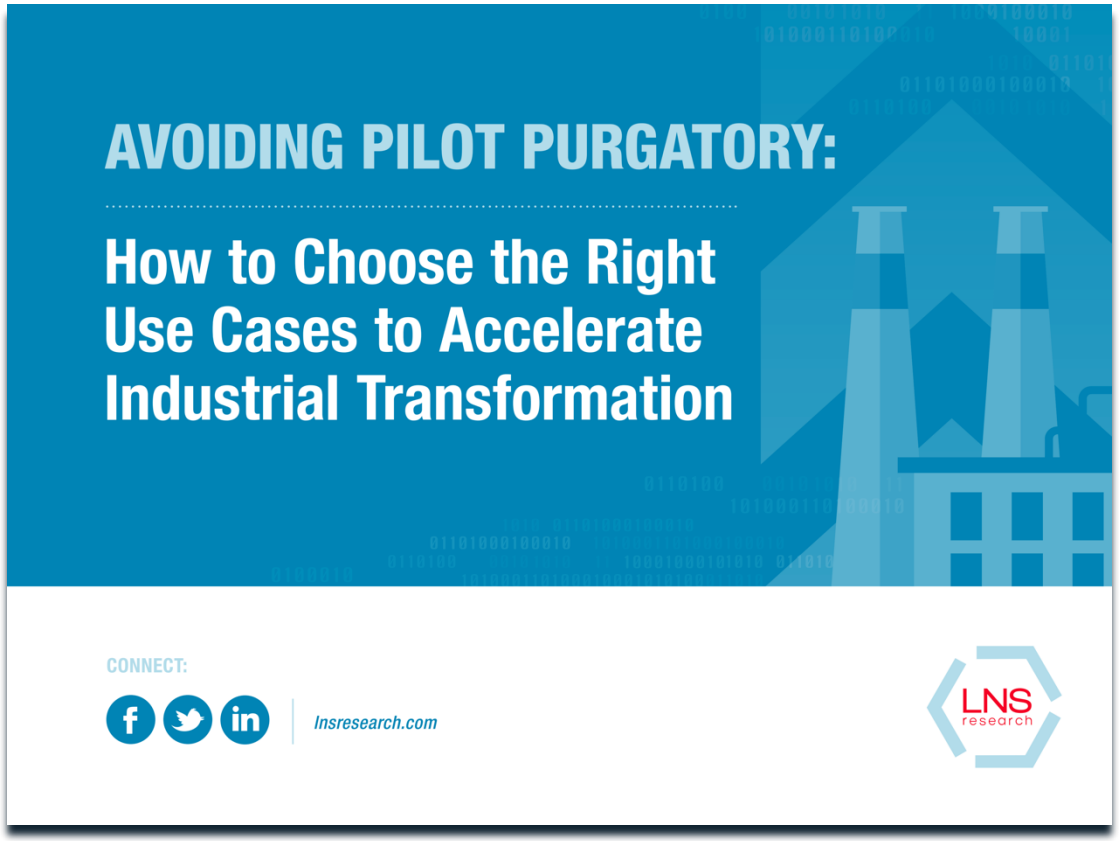
#2 Capital Deployment and Pilot Purgatory



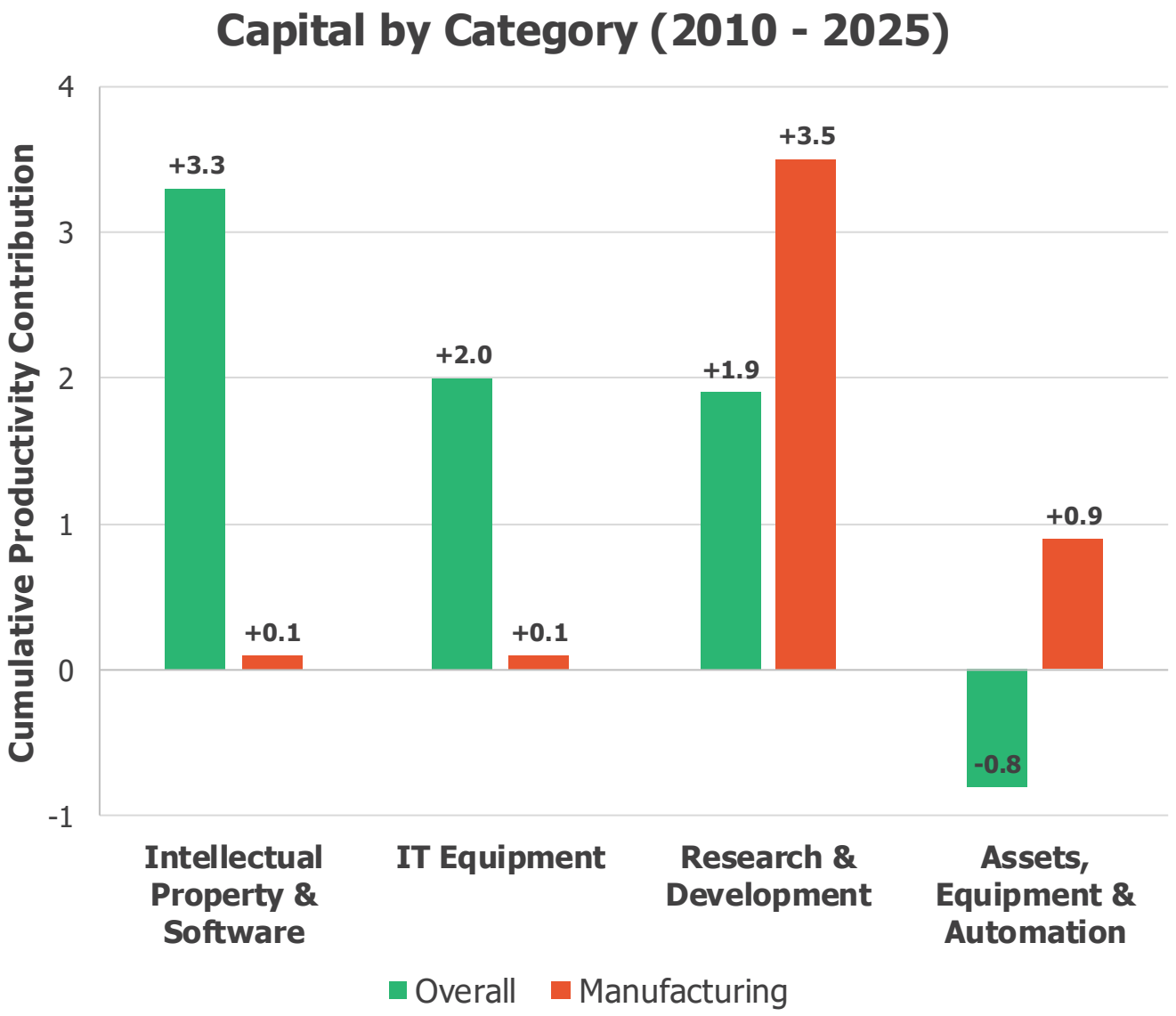
EDITORS' PICK | LEADERSHIP > CMO NETWORK

MIT Finds 95% Of GenAI Pilots Fail Because Companies Avoid Friction

By Jason Snyder, Contributor. ⓘ Jason Alan Snyder is a technologist covering ... Follow Author

Published Aug 26, 2025, 01:22pm EDT, Updated Aug 26, 2025, 05:10pm EDT

#2 Capital Deployment and Pilot Purgatory



- **Same 20th century capital mix.**
- **Without Digital, R&D and automation produce diminishing returns.**

More Questions than Answers…

- **What about the overall companies?**
- **Which companies or vertical industries are outperforming?**
- **Why???**

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The Industrial Productivity Index

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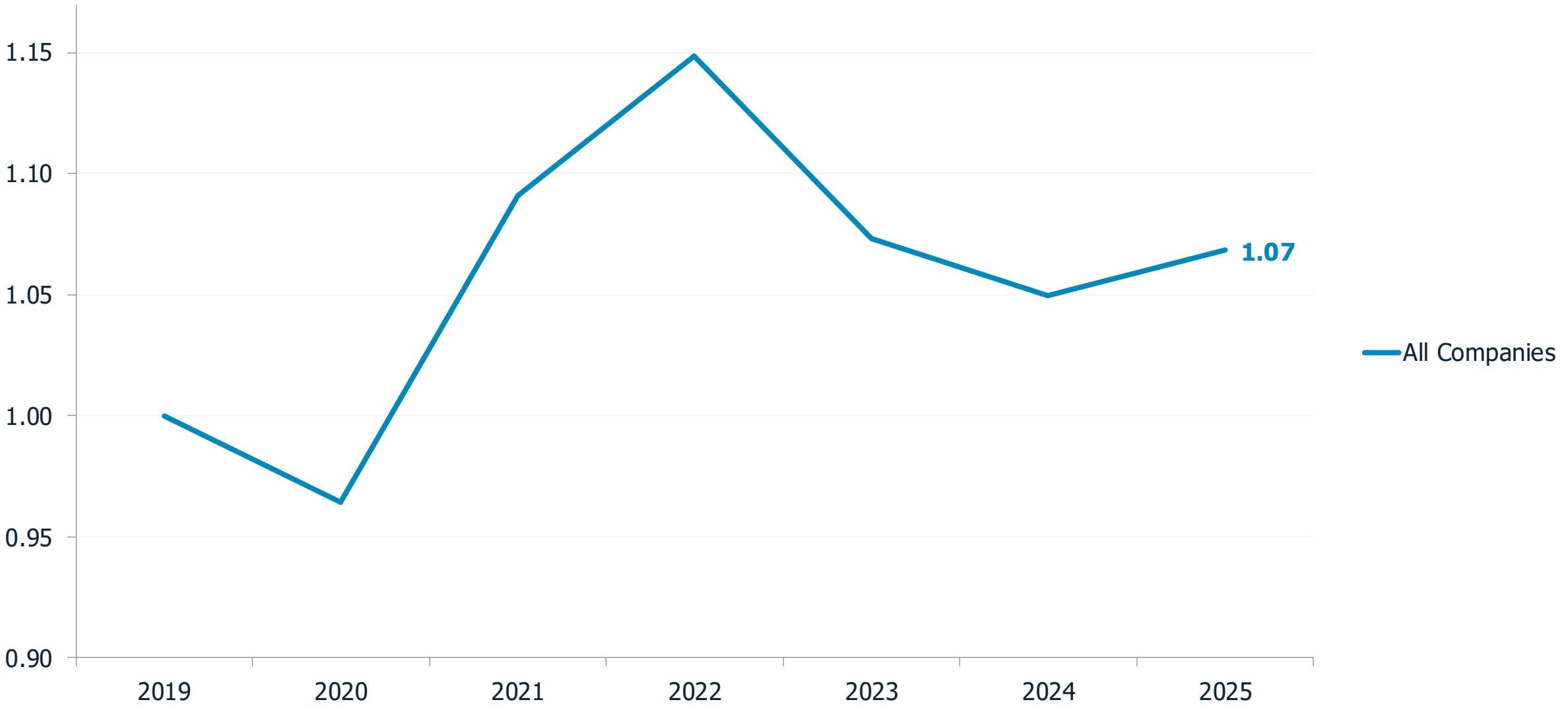
Industrial Productivity Growth Defined

We measure Total Factor Productivity across the end-to-end value chain.

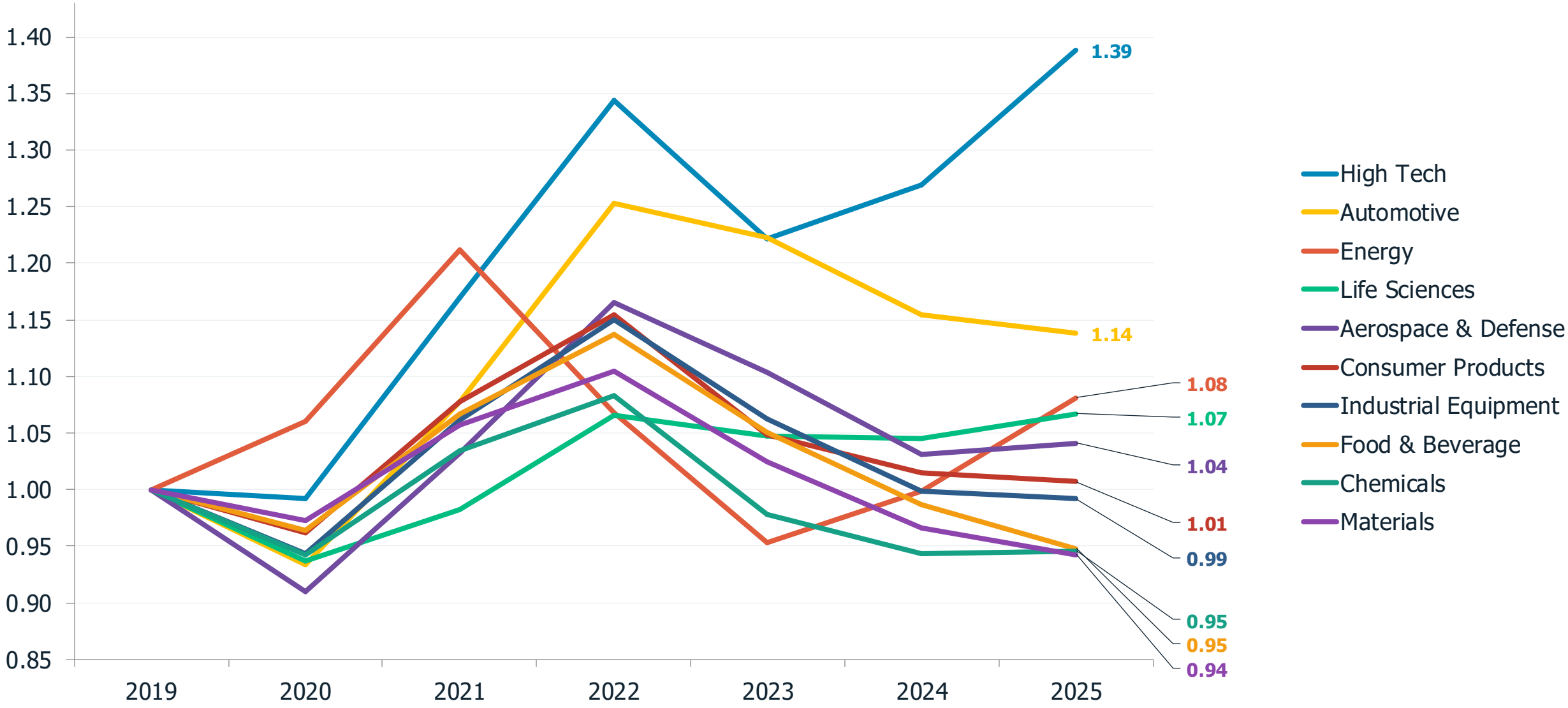
Source: LNS Research

600+ Publicly Traded Companies | 10 Industries
100+ Product Categories | 2019 Indexed Prices

Industrial Productivity Index



Industrial Productivity Index



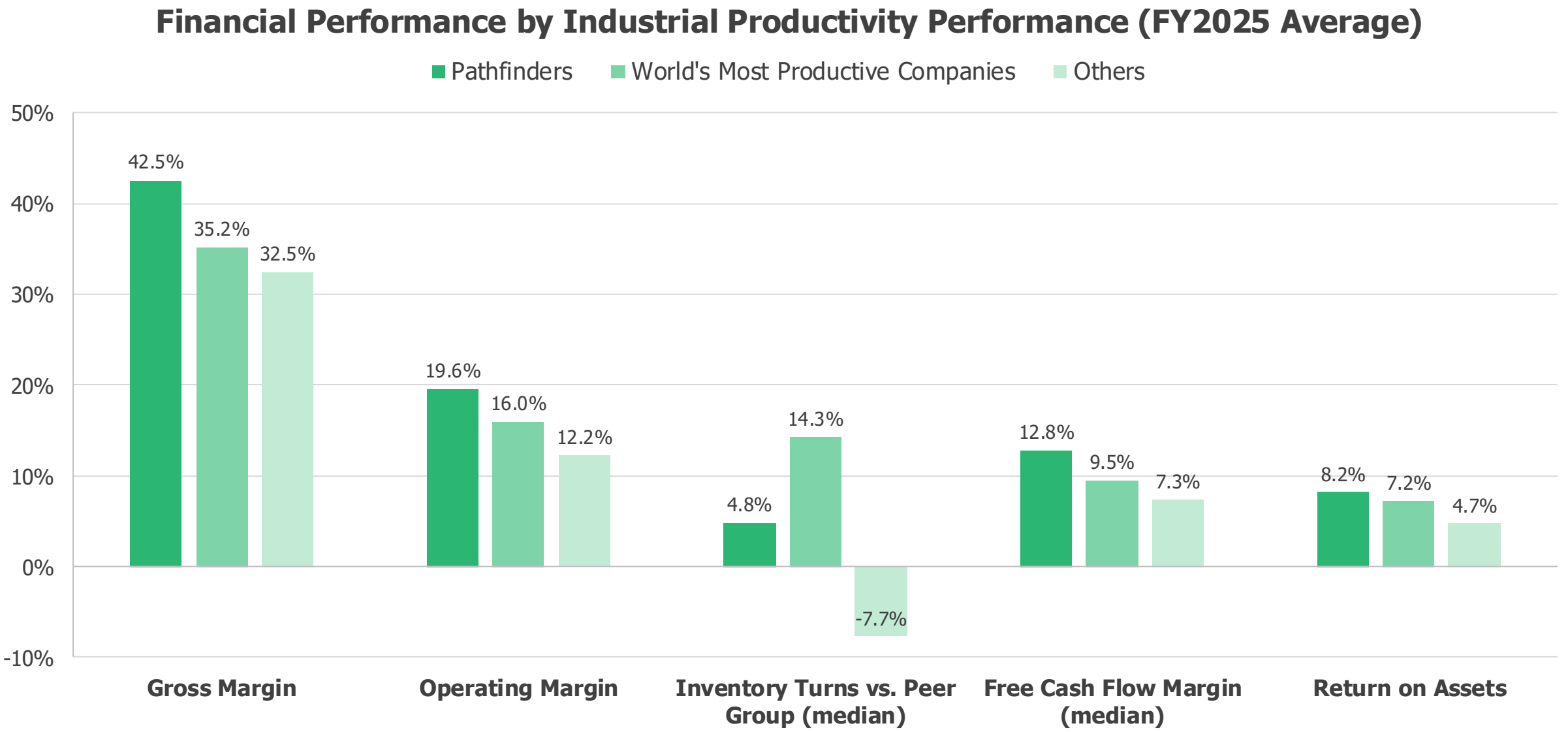
The World's Most Productive Companies

Market-Shaping Enterprises have redefined industry standards through industrial productivity growth.

Productivity Pathfinders™ are top 30 publicly traded companies with the most differentiated industrial productivity growth since 2019 (<5% of IPI)

World's Most Productive Companies™ are top 100 publicly traded companies with the most differentiated industrial productivity growth since 2019 (<15% of IPI)

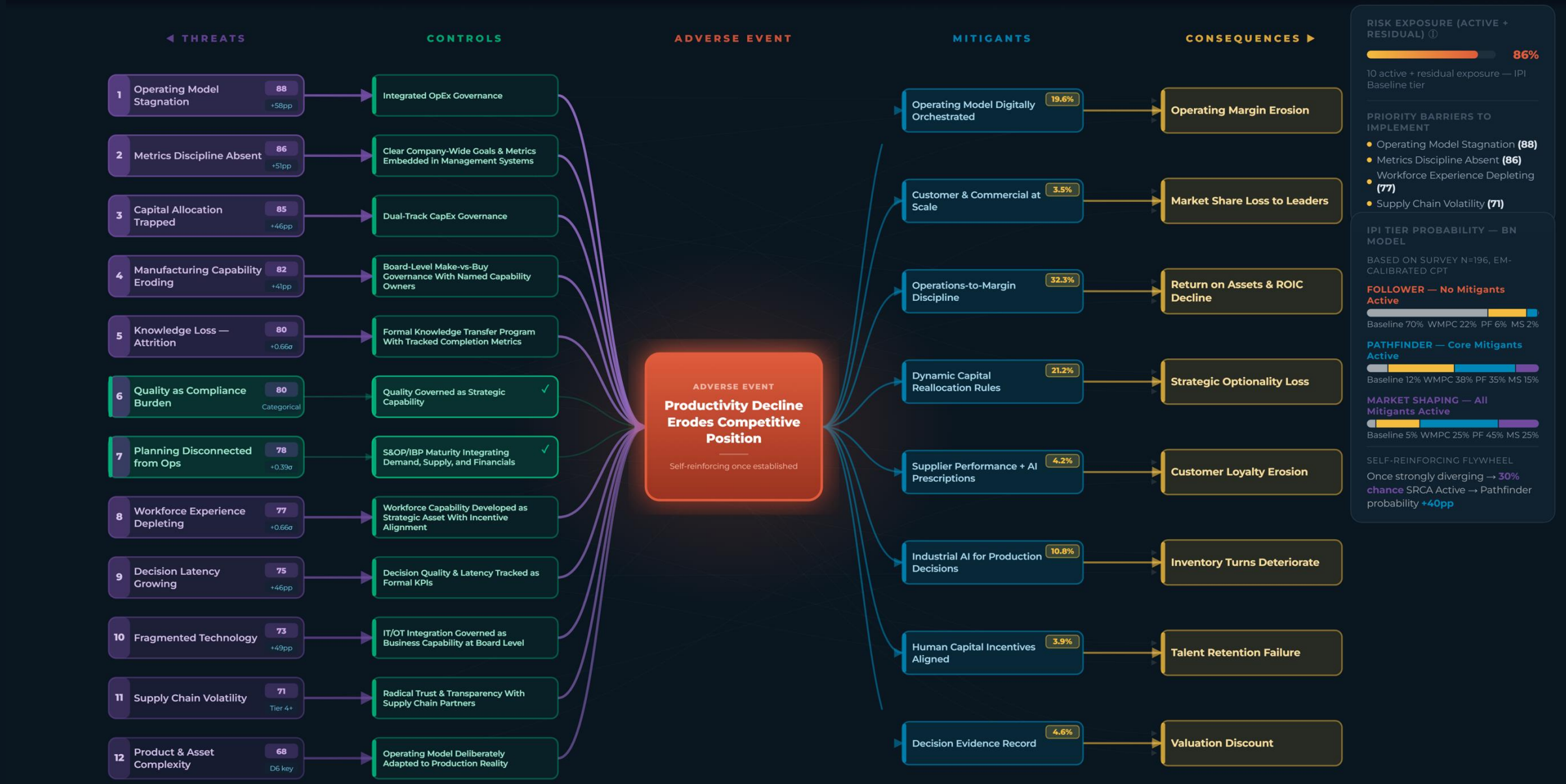
Productivity drives Margin, Free Cash Flow, and Return on Assets



INDUSTRIAL PRODUCTIVITY DIVERGENCE — BOW-TIE RISK MODEL

LNS RESEARCH 2026 · N=196 FIRMS · HOVER ANY NODE FOR DETAIL · SELECT CLIENT TIER TO PERSONALIZE

FOCUS | HIDE LINKAGES | CLIENT TIER: IPI BASELINE | WMPC | PATHFINDER | MARKET SHAPING | CUSTOM



RISK EXPOSURE (ACTIVE + RESIDUAL) ⓘ

86%

10 active + residual exposure — IPI Baseline tier

PRIORITY BARRIERS TO IMPLEMENT

- Operating Model Stagnation **(88)**
- Metrics Discipline Absent **(86)**
- Workforce Experience Depleting **(77)**
- Supply Chain Volatility **(71)**

IPI TIER PROBABILITY — BN MODEL

BASED ON SURVEY N=196, EM-CALIBRATED CPT

FOLLOWER — No Mitigants Active

Baseline 70% WMPC 22% PF 6% MS 2%

PATHFINDER — Core Mitigants Active

Baseline 12% WMPC 38% PF 35% MS 15%

MARKET SHAPING — All Mitigants Active

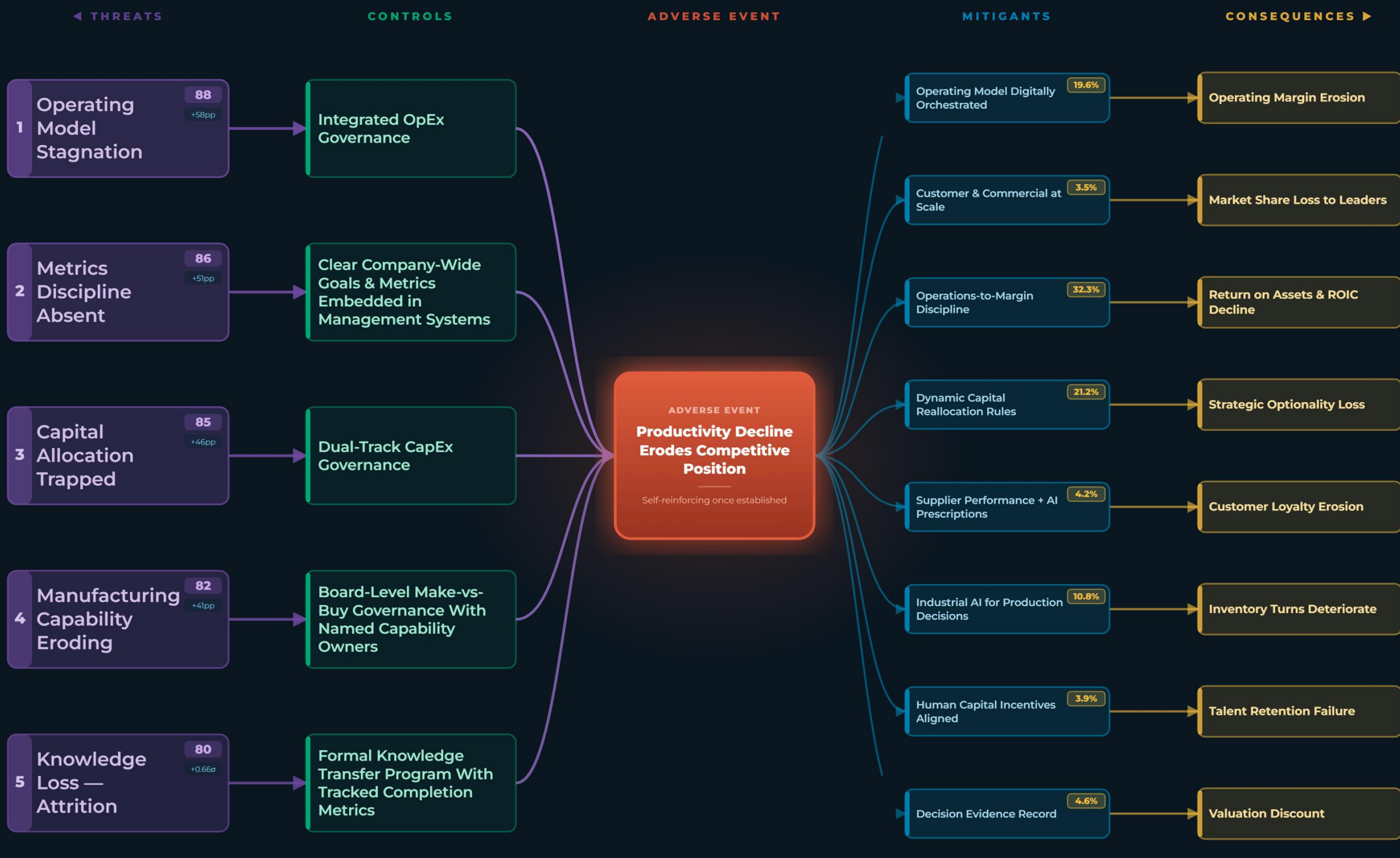
Baseline 5% WMPC 25% PF 45% MS 25%

SELF-REINFORCING FLYWHEEL

Once strongly diverging → **30%** chance SRCA Active → Pathfinder probability **+40pp**

SURVEY **N = 196** | LEADERS **40 (20%)** | FOLLOWERS **134 (68%)** | THREATS **12** | MITIGANTS **8** | CONSEQUENCES **8** | BN SOURCE **EM-CALIBRATED CPT**

THREAT · CONTROL · ADVERSE EVENT · MITIGANT (RECOVERY) · CONSEQUENCE · CONTROL ACTIVE · BN CONTRIBUTION % · BN MODEL: N=196, EM-CALIBRATED


◀ THREATS
CONTROLS
ADVERSE EVENT
MITIGANTS
CONSEQUENCES ▶
1 Operating Model Stagnation
88
+58pp
2 Metrics Discipline Absent
86
+51pp
3 Capital Allocation Trapped
85
+46pp
4 Manufacturing Capability Eroding
82
+41pp
5 Knowledge Loss — Attrition
80
+0.66σ
Integrated OpEx Governance
Clear Company-Wide Goals & Metrics Embedded in Management Systems
Dual-Track CapEx Governance
Board-Level Make-vs-Buy Governance With Named Capability Owners
Formal Knowledge Transfer Program With Tracked Completion Metrics
ADVERSE EVENT
Productivity Decline Erodes Competitive Position
Self-reinforcing once established
Operating Model Digitally Orchestrated
19.6%
Customer & Commercial at Scale
3.5%
Operations-to-Margin Discipline
32.3%
Dynamic Capital Reallocation Rules
21.2%
Supplier Performance + AI Prescriptions
4.2%
Industrial AI for Production Decisions
10.8%
Human Capital Incentives Aligned
3.9%
Decision Evidence Record
4.6%
Operating Margin Erosion
Market Share Loss to Leaders
Return on Assets & ROIC Decline
Strategic Optionality Loss
Customer Loyalty Erosion
Inventory Turns Deteriorate
Talent Retention Failure
Valuation Discount

The COO Council Board

*Chair

Chad Anderson
Chief Manufacturing Officer
Indorama Ventures - Indovinya

Julian Chase
Retired Corporate SVP of Business Operations & Supply Chain
Cargill

Rahul Dharni
Chief Information Officer
Pratt & Whitney

Clay Ellis
Senior Vice President
International Paper

Ellis Jones
Board of Directors
Metallus

Peter Kraemer
Chief Supply Chain Officer (former)
AB inBev

Veena Lakkundi
President, Large-Scale Optical
Apogee Enterprises

Thomas Roemer, PhD
Executive Director, Leaders for Global Operations
MIT

COO Strategic Imperatives

Digitally Orchestrated Execution

Build a Repeatable Operating System

- Equipment Reliability
- Quality at the Source
- Flow and Schedule Discipline
- Daily Problem Solving
- Standard Work

Engineered Intent and Authority

Move Decision Making to the Edge

- Decision Rights Map
- Constraints and Policy Checks
- Evidence and Audit Trail
- Escalation Rules
- Exception Handling

Run the Value Chain as One System

Plan, Procure, Make, Deliver with Control

- Segmentation Strategy
- S&OP Readiness
- Inventory Control and Network Playbooks
- Supplier Performance Management

Translate Operations Into Competitive Advantage

Make Diferentiation Explicit and Repeatable

- Service Reliability and Order Performance
- Delivered Quality Reputation
- Cost Advantage and Margin Expansion
- Risk to Service Resilience
- Innovation Velocity

Build the Capital Fly Wheel

Convert Operational Discipline Into Cash

- Cash Conversion Discipline
- Guidance Accuracy and Capital Cadence
- Constraint based CapEx Allocation
- Dynamic Reallocation Rules
- Value Capture Governance

Build Human Advantage

Compound Capability

- Capability Academies
- Incentives Tied to Casual Chain
- Operating System Talent
- Knowledge as an Asset

Evidence & Credibility

Role Alignment: CEO | COO | CFO | CIO + Commercial Strategy

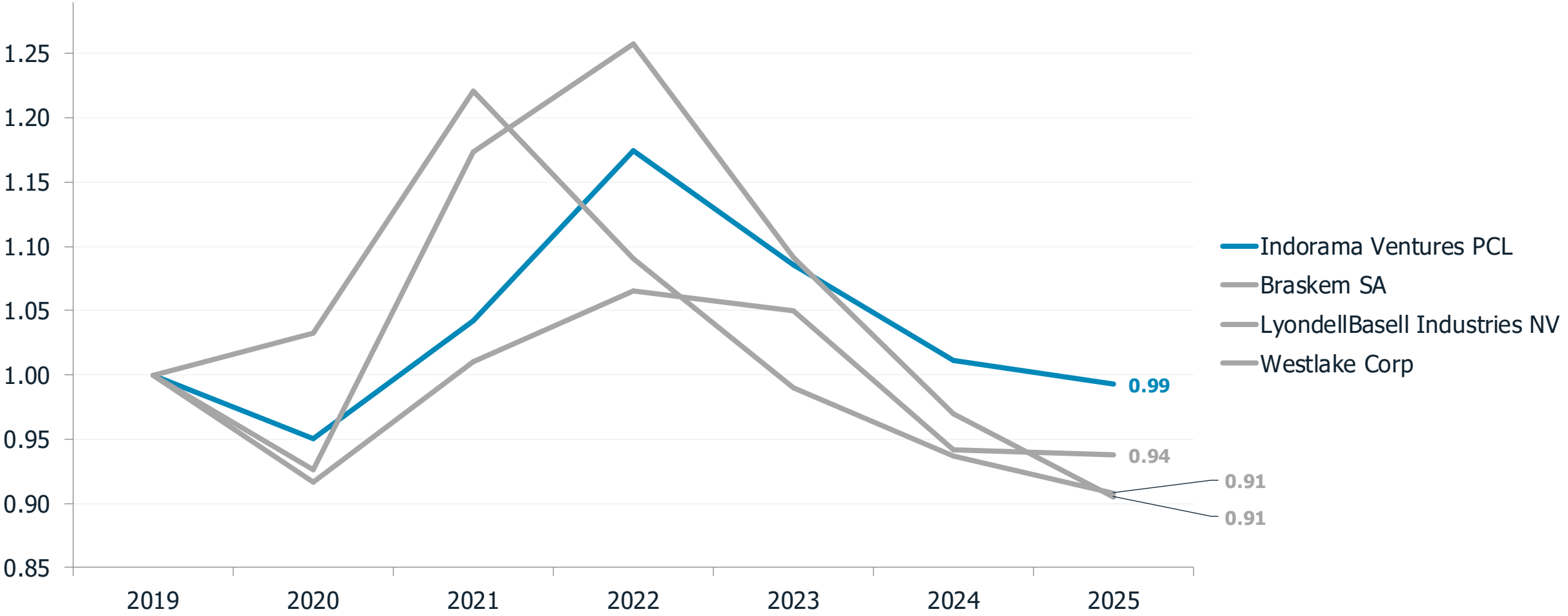
Safety | Quality | Productivity | Sustainability | Delivery

Source: LNS Research

Indorama Ventures – A World's Most Productive Company

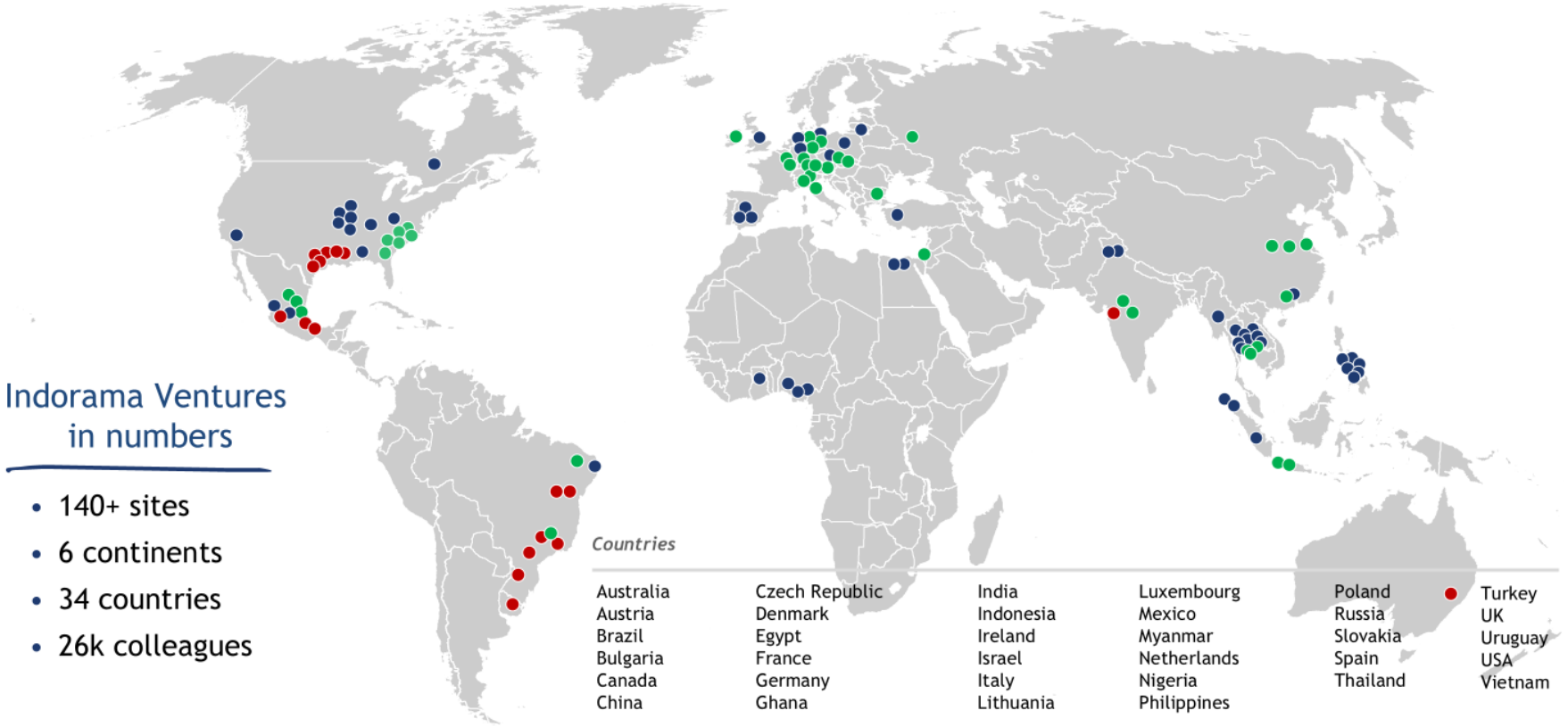
Polymers & Petrochemicals

Chemicals | 4 companies



Indorama Ventures – A World's Most Productive Company

A diverse and integrated global business.. built over acquisitions



Indorama Ventures in numbers

- 140+ sites
- 6 continents
- 34 countries
- 26k colleagues

Countries

Australia	Czech Republic	India	Luxembourg	Poland	Turkey
Austria	Denmark	Indonesia	Mexico	Russia	UK
Brazil	Egypt	Ireland	Myanmar	Slovakia	Uruguay
Bulgaria	France	Israel	Netherlands	Spain	USA
Canada	Germany	Italy	Nigeria	Thailand	Vietnam
China	Ghana	Lithuania	Philippines		

● CPET ● IOD ● Fibers

INDORAMA VENTURES

INDORAMA VENTURES' PURPOSE
REIMAGINING CHEMISTRY TOGETHER TO CREATE A BETTER WORLD

Indorama Ventures – A World's Most Productive Company

Evolution to IVL 2.0: creating value in a changing landscape

	IVL 1.0 2010 - 2023	IVL 2.0 2024 - Future
Strategy	▪ Scale ▪ Global Reach ▪ Value Chain Integration ▪ Client Relationship	▪ FCF Driven Growth ▪ Innovation & Sustainable Solutions ▪ 1st Quartile Cost Structure ▪ Accelerate Value Unlock
Operating Model	▪ Dispersed and Individualized Systems	▪ Unified, Data-Driven, and Digitalized
Shareholder Value	▪ EBITDA ▪ ROCE	▪ FCF ▪ EPS
Leverage	▪ Debt to Equity ~1x	▪ Debt to EBITDA < 3x

Indorama Ventures – A World's Most Productive Company

Our program Transformation 2.0 - *Transformative, Impactful & Achievable*

Finance

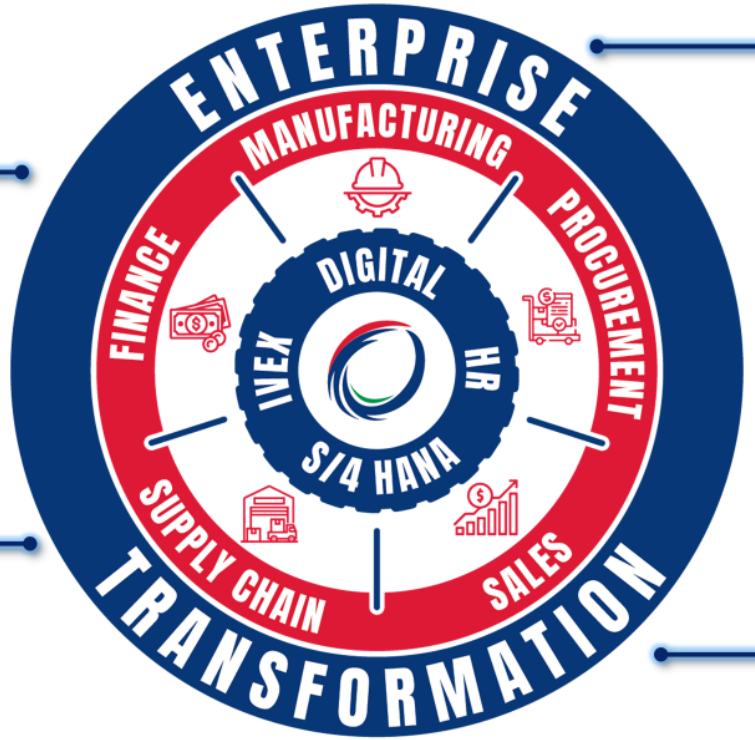
Efficient forecasting & budgeting, Capital Productivity

- ✓ *Planning & Consolidation Tool*
- ✓ *Global Business Solutions*
- ✓ *Cash Pooling*

Supply Chain

Demand & Supply Planning, Scenario Planning & Logistics

- ✓ *Integrated Business Planning*
- ✓ *S4 Hana Optimization - MRP*
- ✓ *Transport Management Solutions*



Manufacturing

Maintenance & Reliability Improvements; TAR & Capex's

- ✓ *Global Capability Centre's*
- ✓ *Maintenance & Reliability*
- ✓ *Frontline Connected Workers*

Procurement

Enhance maturity and value with best-in-class operating model & tools

- ✓ *Value Creation*
- ✓ *Organization Readiness*
- ✓ *Digital S2C Tool*

Sales

Revenue Growth, Improved customer relationship

- ✓ *Customer Relationship Mgmt.*
- ✓ *COMA Tool & TPM*

INDORAMA VENTURES

INDORAMA VENTURES' PURPOSE
REIMAGINING CHEMISTRY TOGETHER TO CREATE A BETTER WORLD

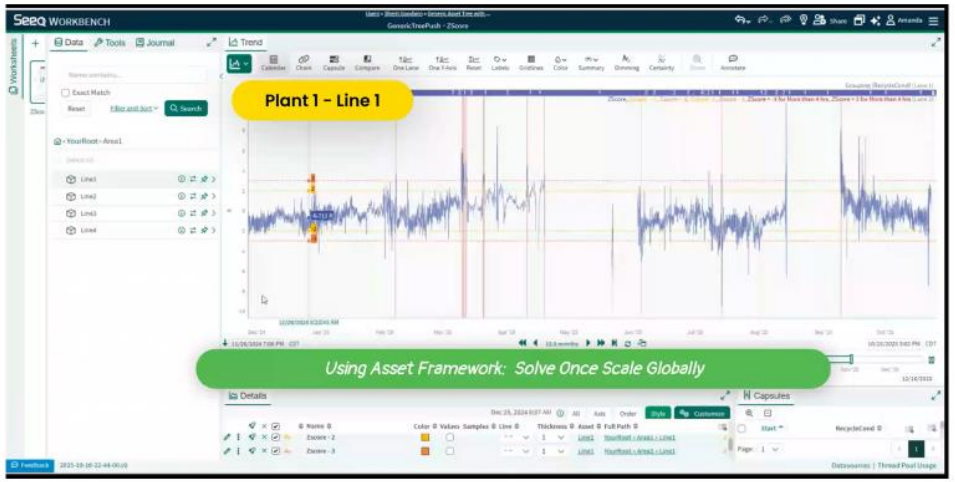
Indorama Ventures – A World's Most Productive Company

Technology Team Global Support

Proof of Scaling & Remote Monitoring

From Solving a Local Problem to Scaling a Global Solution

Available Data + Ascent
Process Expertise +
Reliability Expertise +
Digital Skills for Scaling + Seeq
Data Scientist's Deep Knowledge

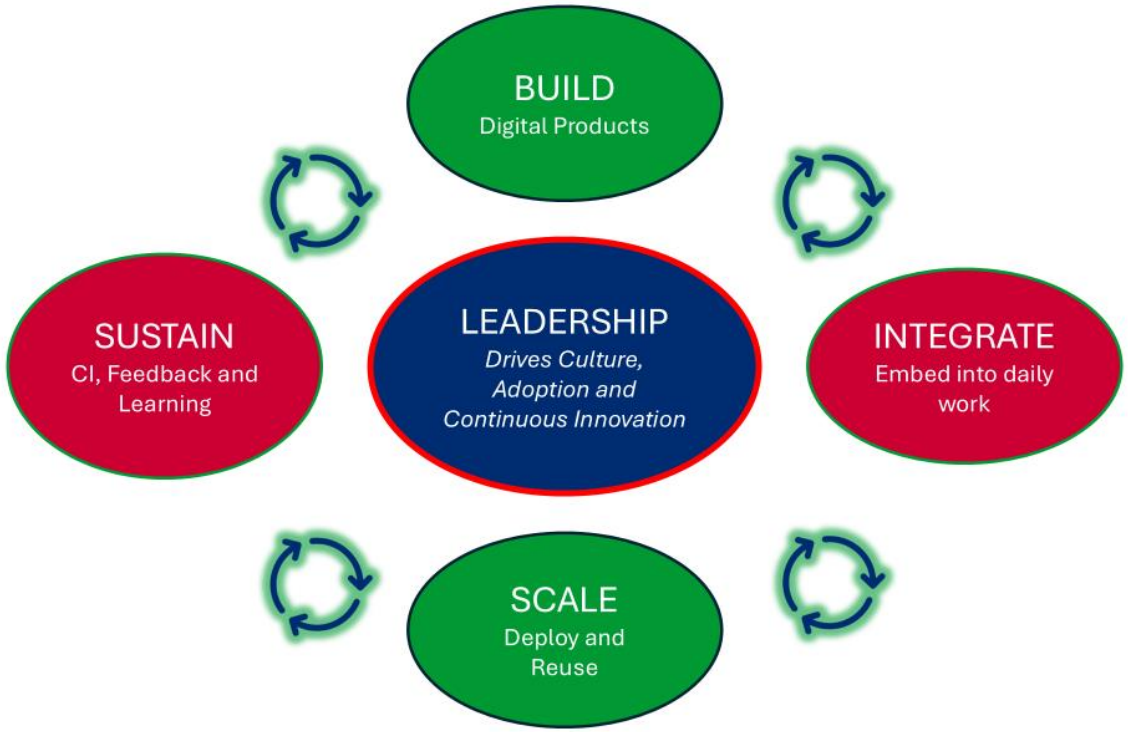


Scaled through Asset Tree's now all sites can be monitored {Dashboard}

Indorama Ventures – A World's Most Productive Company

The Final Mile of Digital Delivery

Where technology meets leadership, culture, and daily work practices



The hardest part isn't the technology — it's embedding new ways of working.

Integrate digital tools into daily operations and decision-making

Establish feedback loops to detect and correct deviations early.

Empower teams to trust and act on digital insights.

Align leadership behaviors to model and reinforce digital adoption.

Shape culture that values learning, accountability, and continuous improvement.

Industrial AI Maturity

Scaling Adoption and Delivering Business Value

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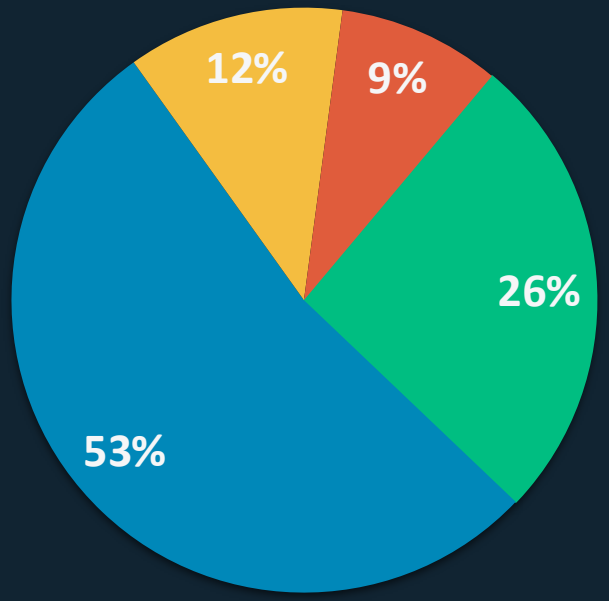
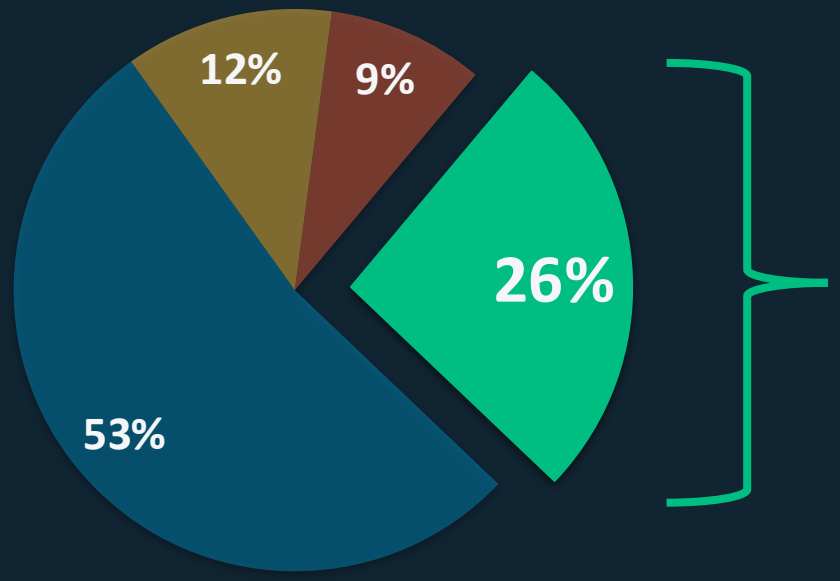
Current State of Adoption



Industrial AI Adoption

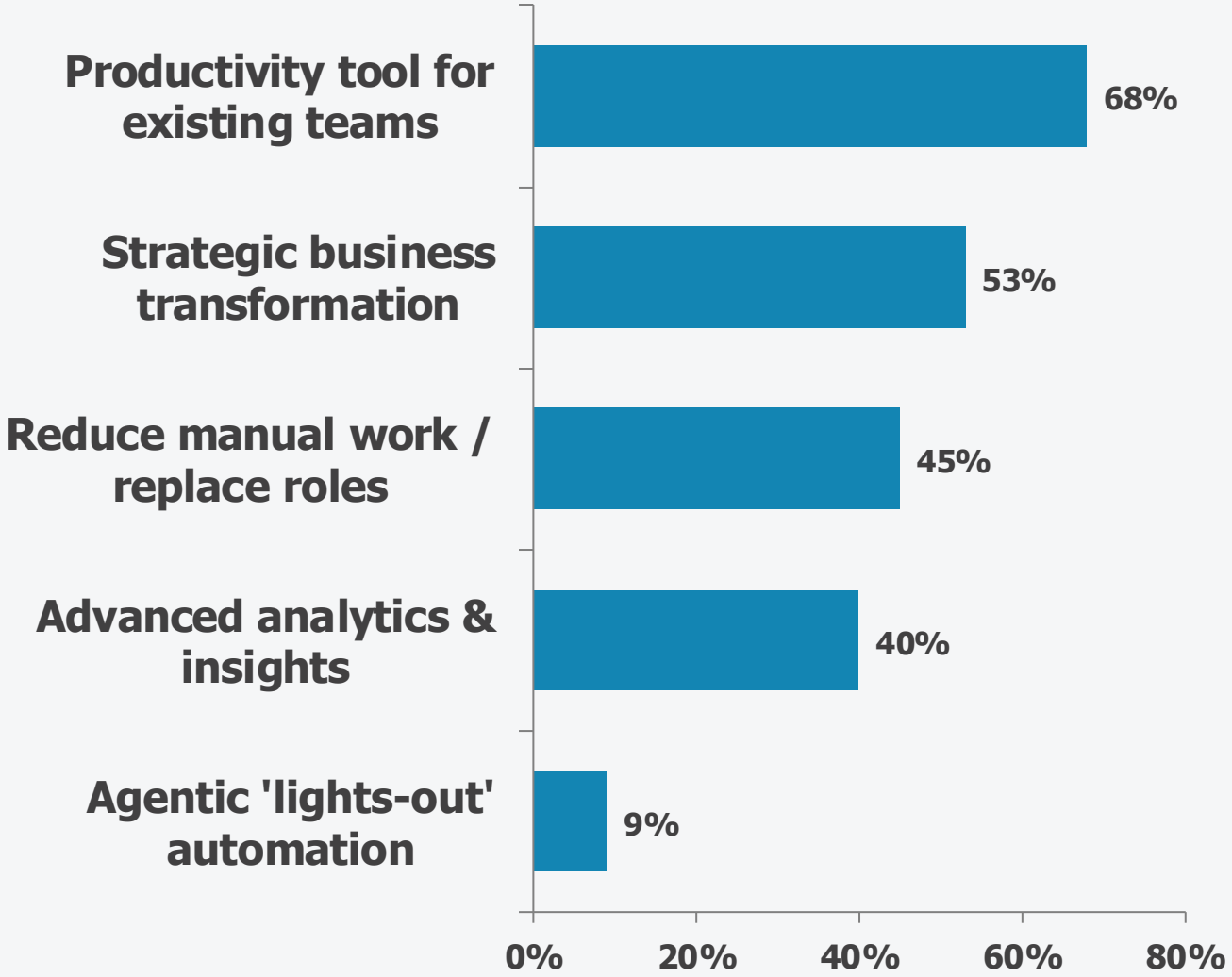
- **Unprecedented levels of investment.**
- **91% of surveyed companies have or are planning to adopt Industrial AI.**

Current State of Adoption



Widely implemented
Deploying & Scaling pilots
Budgeting/Planning
No plans

Industrial AI Approach for Widely Implemented



Industrial AI Top 5 Failure Modes:

1. Data Quality and Availability
2. AI Disconnected from Operating Model
3. Market Hype vs. Reality
4. AI Sustainment Skills
5. Decision Rights and Decision Latency

EDITORS' PICK | LEADERSHIP > CMO NETWORK

MIT Finds 95% Of GenAI Pilots Fail Because Companies Avoid Friction

By Jason Snyder, Contributor. ⓘ Jason Alan Snyder is a technologist covering ... Follow Author

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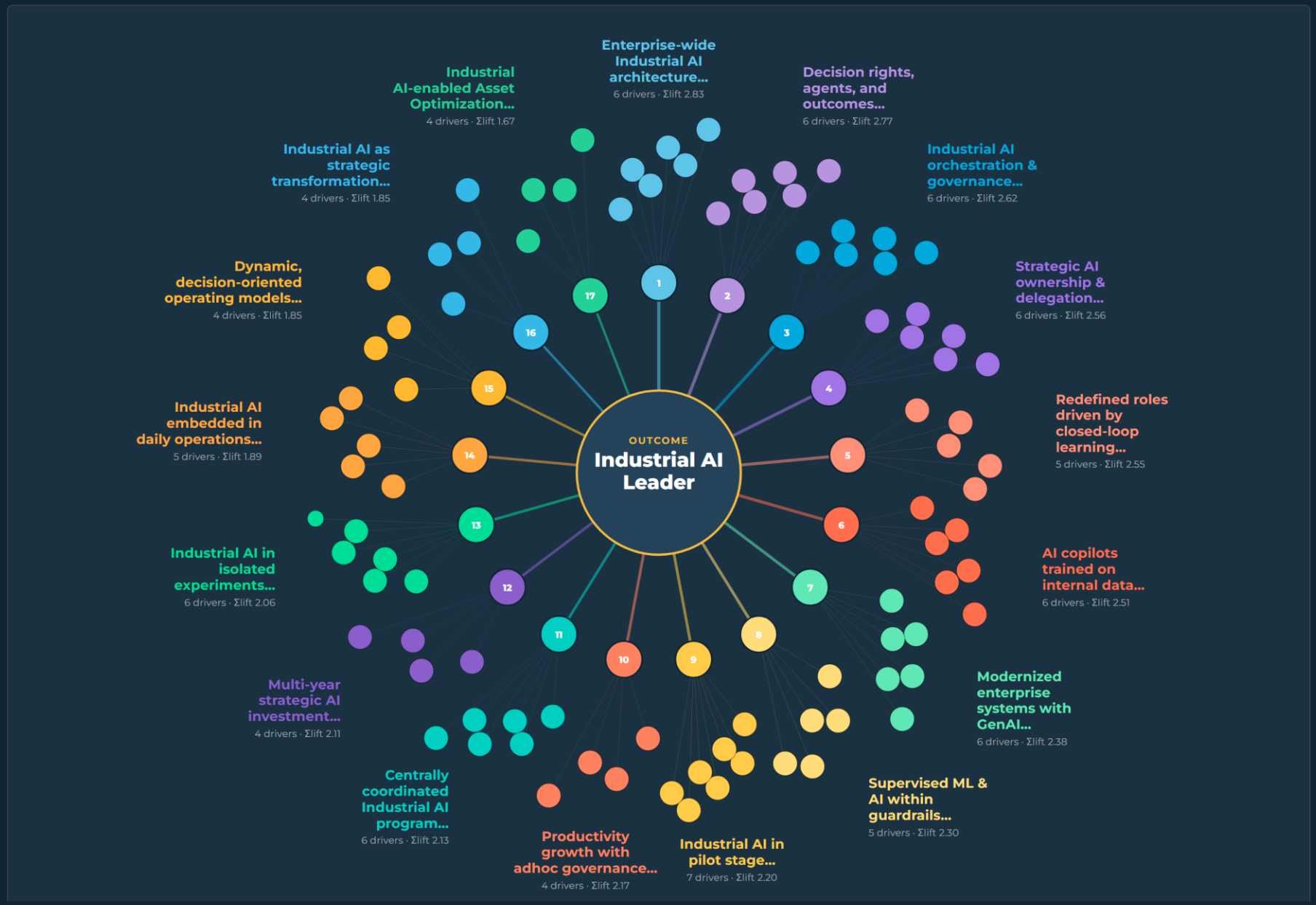
LNSAI Becoming an Industrial AI Leader

Key Drivers Analysis | Industrial AI Maturity and Prioritization | Self Assessment



THE OUTCOME AT THE HUB

Industrial AI Leader. Scaled Industrial AI enterprise-wide, delivering significant business value. About **30%** of industrial companies qualify today.

EVIDENCE COVERAGE

YES	0 / 90 practices
PLAN	0 / 90 practices
NO	0 / 90 practices
UNK	90 / 90 practices

Synthesis nodes set: 0 / 17

HOW TO READ THE WHEEL

- **Rank**: 1 = highest lift.
- **Spoke thickness** = sum of lifts.
- **Bubble size** = that practice's lift.
- **Position**: clockwise from 12 by lift.

WHAT THE NUMBERS MEAN

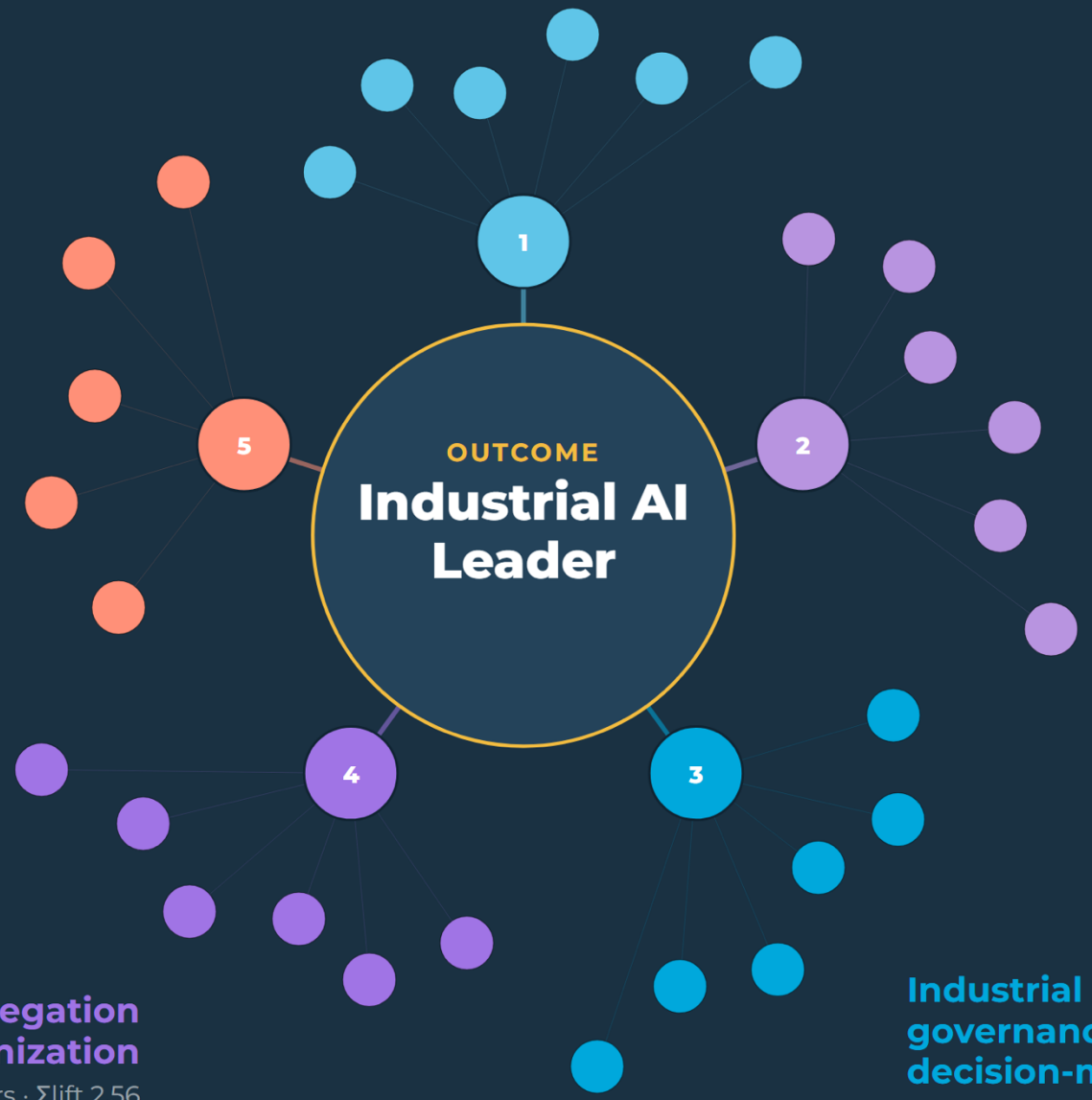
Synthesis node / Practice
A node groups related practices that act as one signal toward the Leader outcome. Each practice is a single capability question.

Lift / Σ Lift
Lift = how much one practice alone, if Yes, raises the Leader chance. +20% lift moves 30% to ~50%. Σ Lift = sum across a node.

P(Leader|adopt)
Probability of being a Leader given this practice is adopted. Baseline in the analyst weight slider.

prior (0.30)
Starting chance before any evidence. Lift is measured against this.

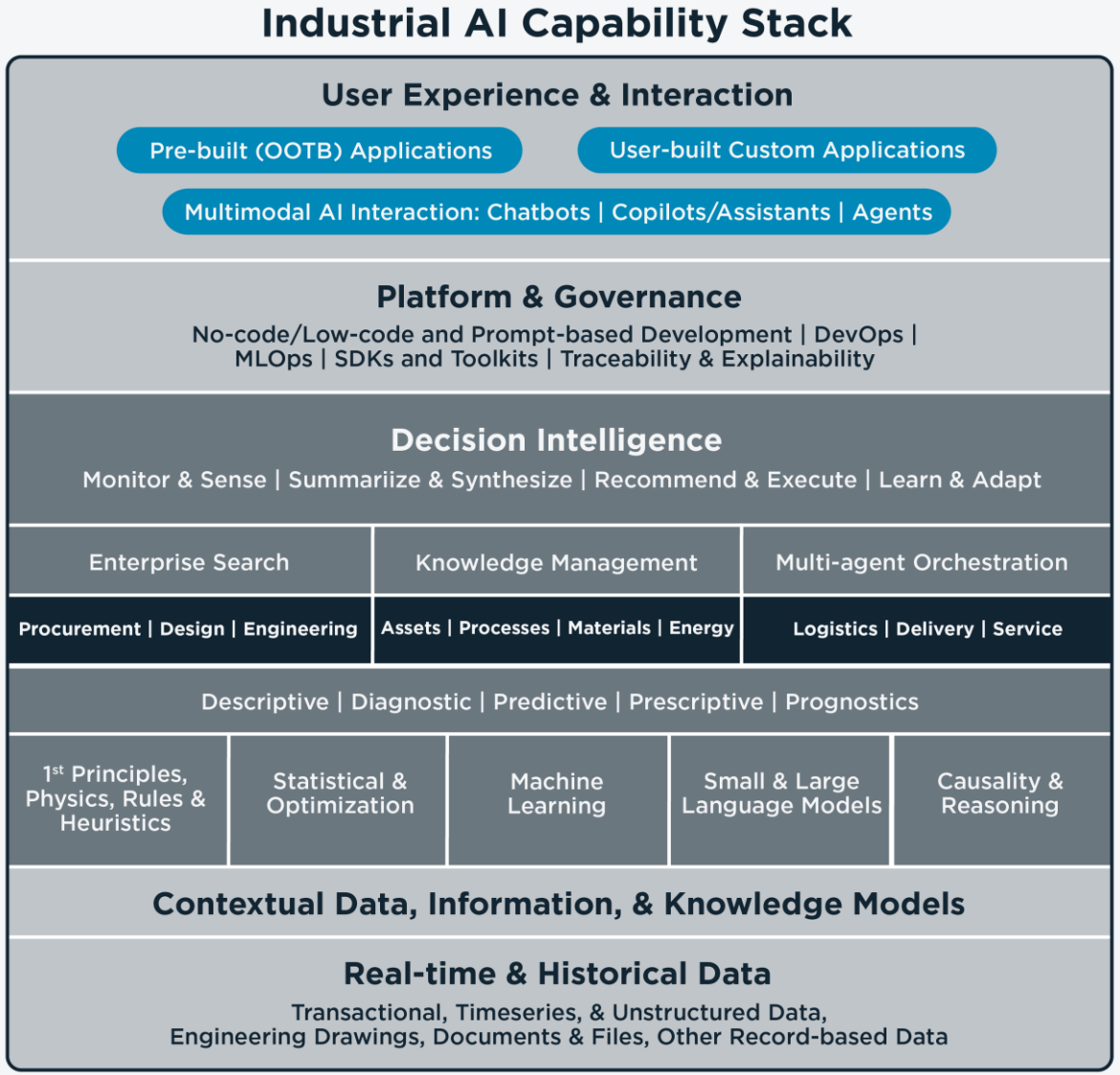
Weight
Analyst override of P(Leader|adopt). Defaults to the model value.


Industrial AI centralized at corporate with enterprise-wide architecture and machine learning capabilities
6 drivers · Σlift 2.83
1
Decision rights, agents, and outcomes pushed to frontlines
6 drivers · Σlift 2.77
2
Industrial AI orchestration and governance enabling trusted, adaptive decision-making
6 drivers · Σlift 2.62
3
Strategic AI ownership and delegation exists across the organization
6 drivers · Σlift 2.56
4
Redefined roles driven by closed-loop learning system and outcomes
5 drivers · Σlift 2.55
5
OUTCOME
Industrial AI Leader

Lessons from Leaders: Top Three Takeaways

1. DataOps foundation with Agentic Closed Loop Learning: Decision to Action

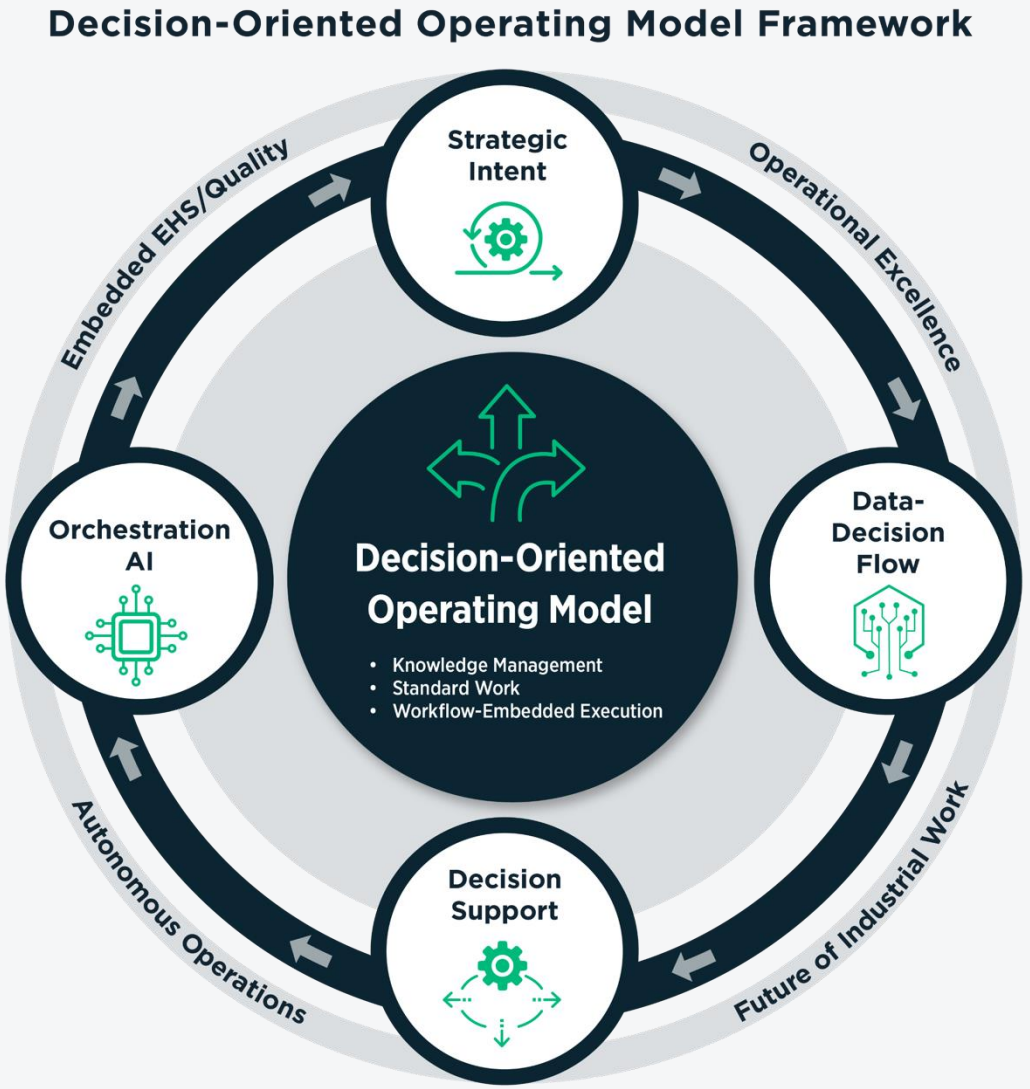
Embed Industrial AI in Enterprise Architecture



Lessons from Leaders: Top Three Takeaways

1. DataOps foundation with Agentic Closed Loop Learning: Decision to Action
2. Dynamic, Decision-Oriented Operating Models that embed Industrial AI

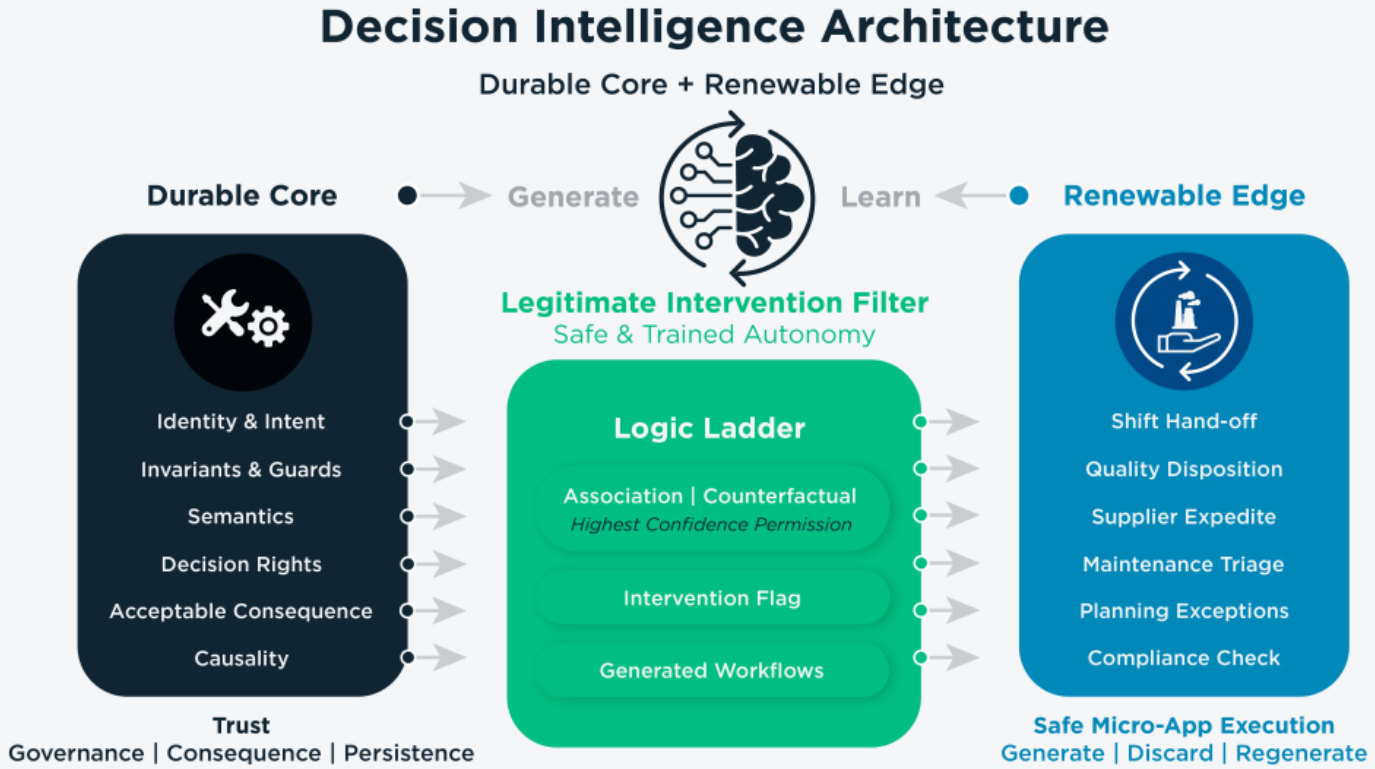
Dynamic, Decision-Oriented Operating Models are the Way Forward



Lessons from Leaders: Top Three Takeaways

1. DataOps foundation with Agentic Closed Loop Learning: Decision to Action
2. Dynamic, Decision-Oriented Operating Models that embed Industrial AI
3. Eliminate Dashboard Fatigue and Enable Accountable Outcomes

Decision Intelligence: From Dashboard Fatigue to Accountable Outcomes



LNS Research

Thank You