YOKOGAWA

Co-innovating tomorrow™

From Silos to Synergy:
Achieving Operational Excellence Through Asset Operations Management

Kah-Ming CHAI

Executive Consultant

22 May 2025

CENTUM 50th ANNIVERSARY

Speaker Profile

Kah-Ming Chai
Digital Strategy & Promotion
Digital Enterprise Solutions Division

Yokogawa Engineering Asia
5 Bedok South Road,
Singapore (469270)

Tel +65 6249 6729
Mob +65 92322918
kahming.chai@yokogawa.com

Profile

Kah-Ming is a Registered Management Consultant who is also a SIRI & COSIRI assessor. He has advised more than 30 factories across industrial sectors including petrochemicals, power generation, pulp & papers, building materials, food & beverages and automotives in APAC and Middle East. Other functional roles held by Kah-Ming over the span of his 20 years career include business development, project management and system engineering.

Consulting Experience

- Completed more than 30 SIRI assessment and roadmap design services, identified value creation potential estimated at USD300 million.
- Conducted feasibility studies for implementation of IoT analytics for rotating equipment to more than 80 sites across Asia Pacific between 2021 to 2022.
- Saved US$2.5M for project owner by identifying scope gaps in the IT-OT integration blueprint for a mega capital project in 2019.
- Led as client partner for a US$3M digital operation management program catering for 2,500 users in a new petrochemical complex in Asia in from 2018 to 2019.

Education

- MBA, UCLA Anderson & NUS Business School, US & Singapore
- PGDip Digital Management, Teesside University, UK
- BSc (Hons) in Electrical Engineering, University Technology Malaysia

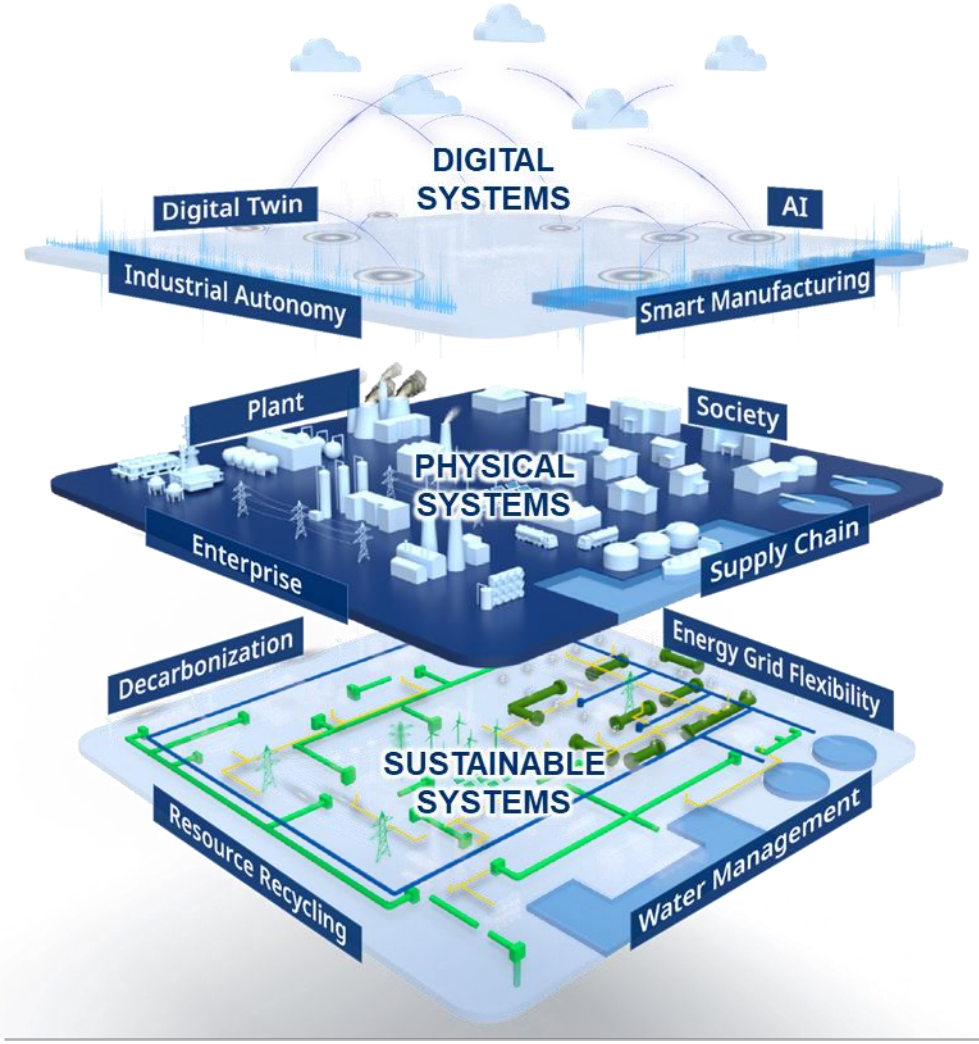
From Silos to Synergy: Achieving Operational Excellence Through Asset Operations Management

1. About Us
2. Challenges
3. Asset Operations Management
4. Examples
5. Key Takeaways

Yokogawa's Purpose

Utilizing our ability to measure and connect, we fulfill our responsibilities for the future of our planet.

Drivers of SoS in Industry: Global Trend towards SoS



Combining emerging digital technologies

Digital interconnectedness・・・ Advancements in data capture and analysis expedite data sharing and analysis across systems.

Digital twin technology・・・・・・ As more systems adopt digital twins, they enable modeling of SoS connections to predict additional synergistic and emergent value.

Interorganizational connectivity

There has been a long-term drive for businesses to physically cluster and collaborate for mutual benefit to improve efficiency and gain a competitive advantage.

Collaboration for sustainability

Linkage among systems enables overall optimization and contributes to achieving the ESG goals of organizations and society.

Building a Sustainable Future Together

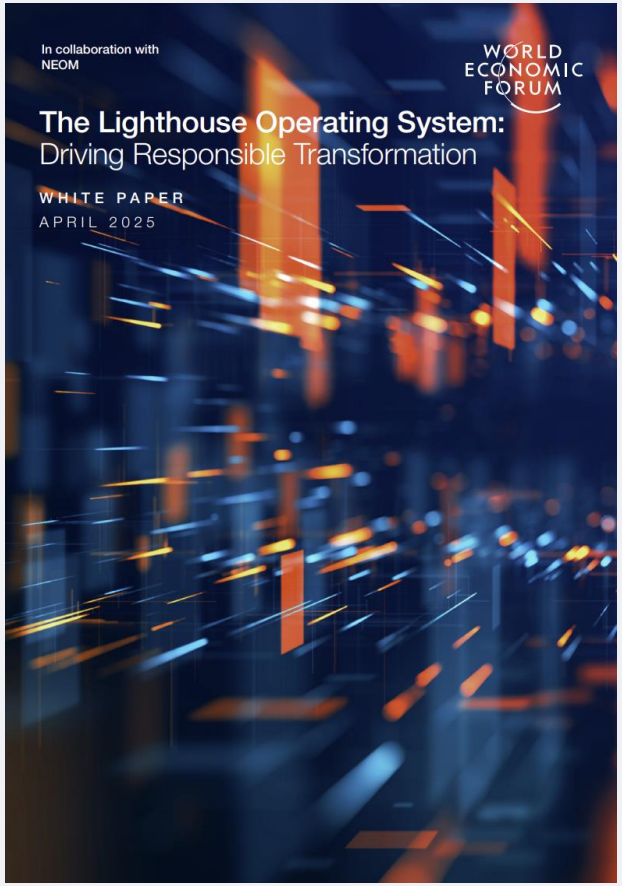
Challenges and Opportunities

Challenges Across Industries

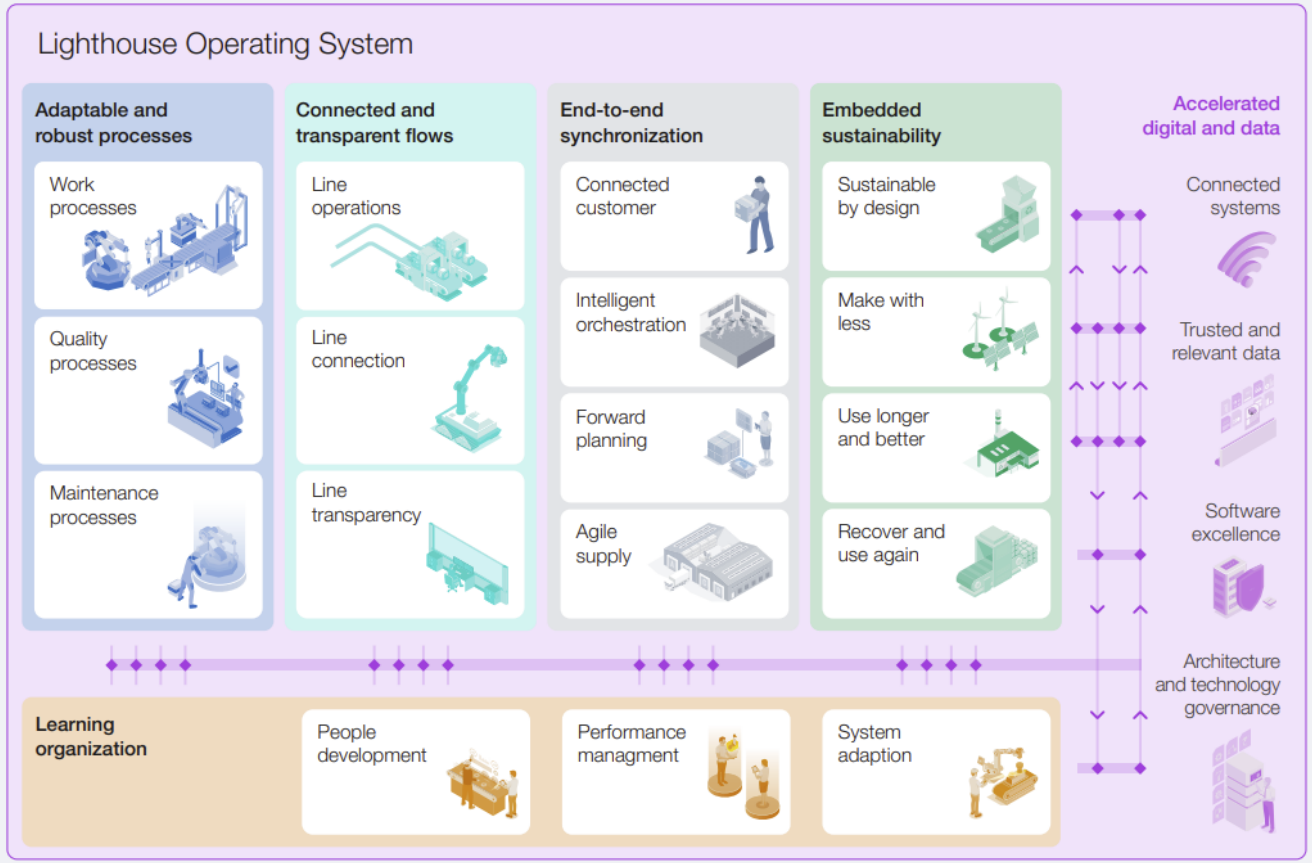
- **High operational costs** due to inefficiencies in processes and resource utilization.
- **Unplanned downtime** disrupting production and impacting revenue.
- **Complex data** and **system silos**, making decision-making slow and inaccurate.
- **Lack of predictive insights** leading to suboptimal maintenance strategies.
- **Talent shortage** and ineffective **knowledge retention** affecting team effectiveness.
- **Technological limitations** hindering the adoption of scalable and advanced solutions.
- **Collaboration gaps** undermining the effectiveness of cross-functional operations.

WEF – Lighthouse Operating System 2025

Developed using insights from 189 Global Lighthouse



Published: 7 April 2025



Lighthouse Maturity Model – 5 Steps

CONSUMER SUSTAINABILITY INDUSTRY READINESS INDEX

5 Ecosystem-leading

Cutting-edge sustainability, digitalization and operational efficiency

SMART INDUSTRY READINESS INDEX

4 Business-shaping

3 Technology-enabled

2 Process-optimized

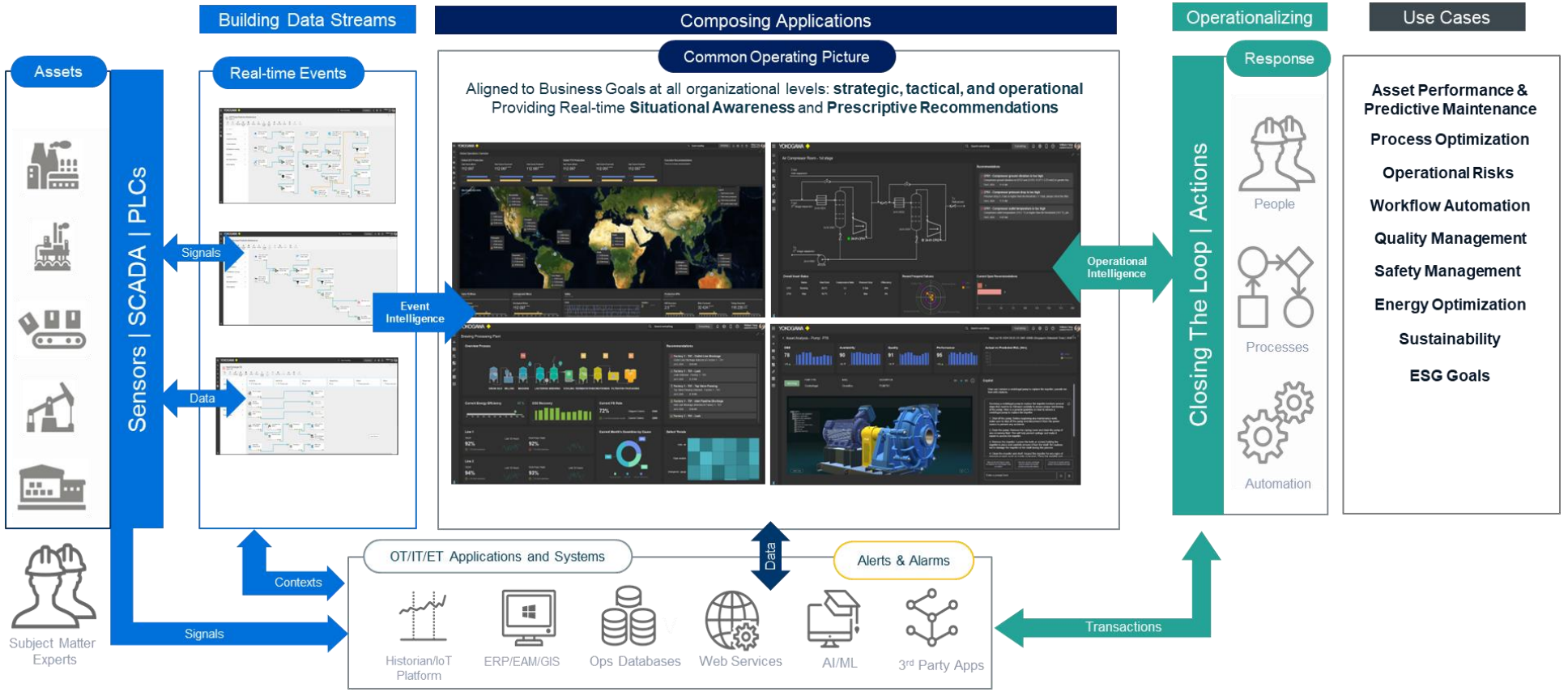
1 Standarized

Traditional/pre-lean

Asset Operation Management

Asset Operations Management - Overview

“AOM is a solution framework and a **collaborative platform** with domain-specific libraries and accelerators, for rapidly composing holistic and scalable solutions that address critical industrial challenges in **business performance**, **process optimization**, **asset performance**, **sustainability** & **compliance** cost-effectively, powered by **Composable Digital Twins** and **Agentic AI**, driven by **value creation** and guided by **domain know-how** (SMEs).”



Use Cases by Industries

Oil & Gas

Mining

Water

Maintenance

Asset Performance

Condition Monitoring
Anomaly Detection
Failure Prediction
Prescriptive Recommendations
Decision Augmentation and Automation

Control

Process Optimization

Integration with Control Systems for Process Monitoring
AI-Driven Process Optimization
Scenario-Based Simulation & Performance Forecasting
Optimized Throughput & Yield Management

Operations

Operational Efficiency

Digital Twin-Enabled Operational Visibility
Workflow Automation
Workforce Augmentation
Energy & Resource Efficiency Optimization
Quality, Safety & Compliance

What's Under the Hood? – Digital Twins and AI

Asset Operations Management Use Cases

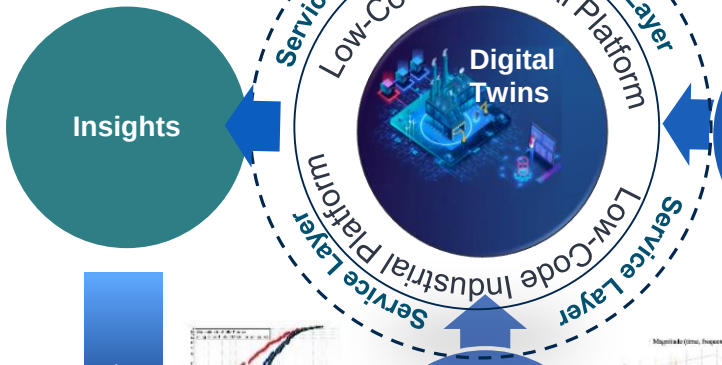
- Predictive Maintenance
- Process Optimization
- Operational Efficiency
- Workflow Automation
- Energy Efficiency
- Safety Assurance
- Product Quality
- Overall Equipment Effectiveness
- Emission & Leakage Management
- Sustainability & ESG Goals

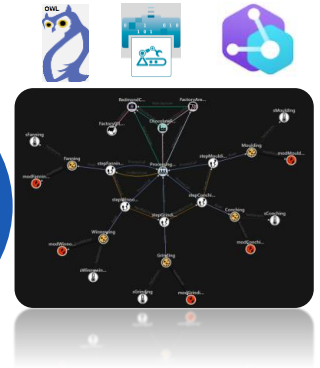
Condition Monitoring
Anomaly Detection
Root Cause Analysis
Predictive Analytics
Prescriptive Recommendations
Autonomous Operations

Automation

MQTT OPC UA { REST:API }

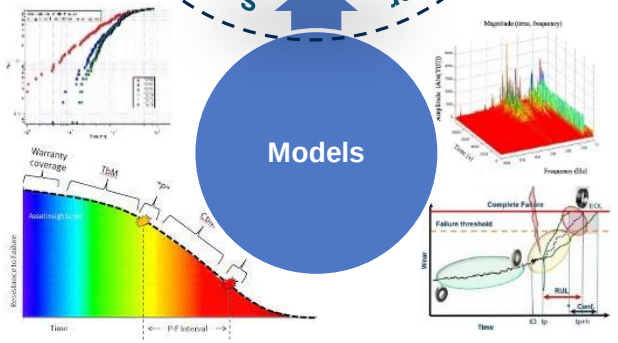
Sensor & time series data
Transactional & event data
Unstructured & environmental data





Semantic Models:
Asset Hierarchy, Master Data
Instrumentation, Sensors
Failure Modes, Causes, Indicators
Protections, Recommendations

Autonomy

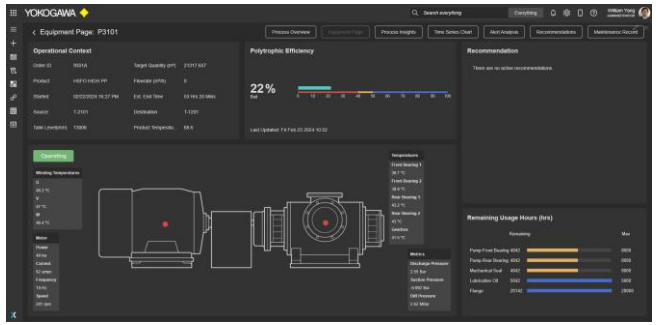


MATLAB scikit-learn XGBoost

Simulation, prediction, and optimization
Physics-based models
Mathematical models
Statistical models
AI/ML models, LLMs, GenAI
Descriptive-diagnostic-predictive-prescriptive

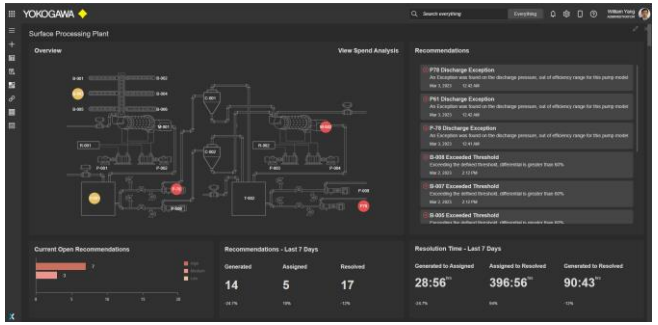
Accelerators for Rapid Implementation

- **Libraries** comprise Semantic Models and Analytical Models including AI/ML
- **Patterns** are pre-configured data streams or widgets (for the App Designer) that can be imported into as building blocks for your applications.
- **Blueprints** are pre-built solutions that combine data streams, app visualizations, recommendation rules and models. They are easy to import into your own environment, configure with your business systems and customize to your unique needs.

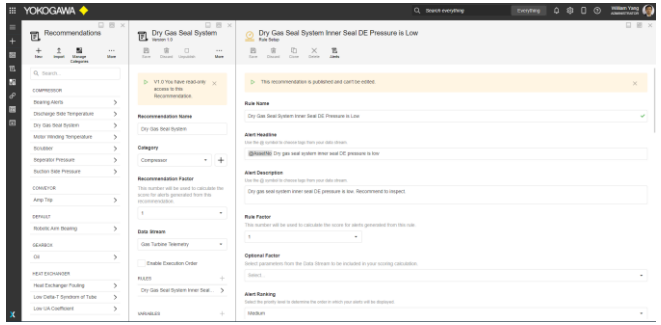


Pumps Performance Monitoring UX

Pumps Predictive Maintenance Data Stream

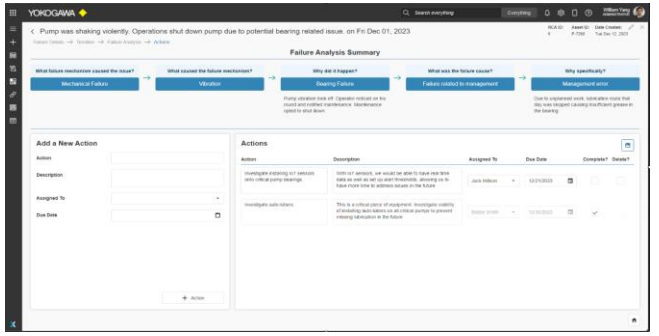


Process Unit Event Board UX



Dry Gas Seal Prescriptive Recommendation Rules

Global Operations Overview UX

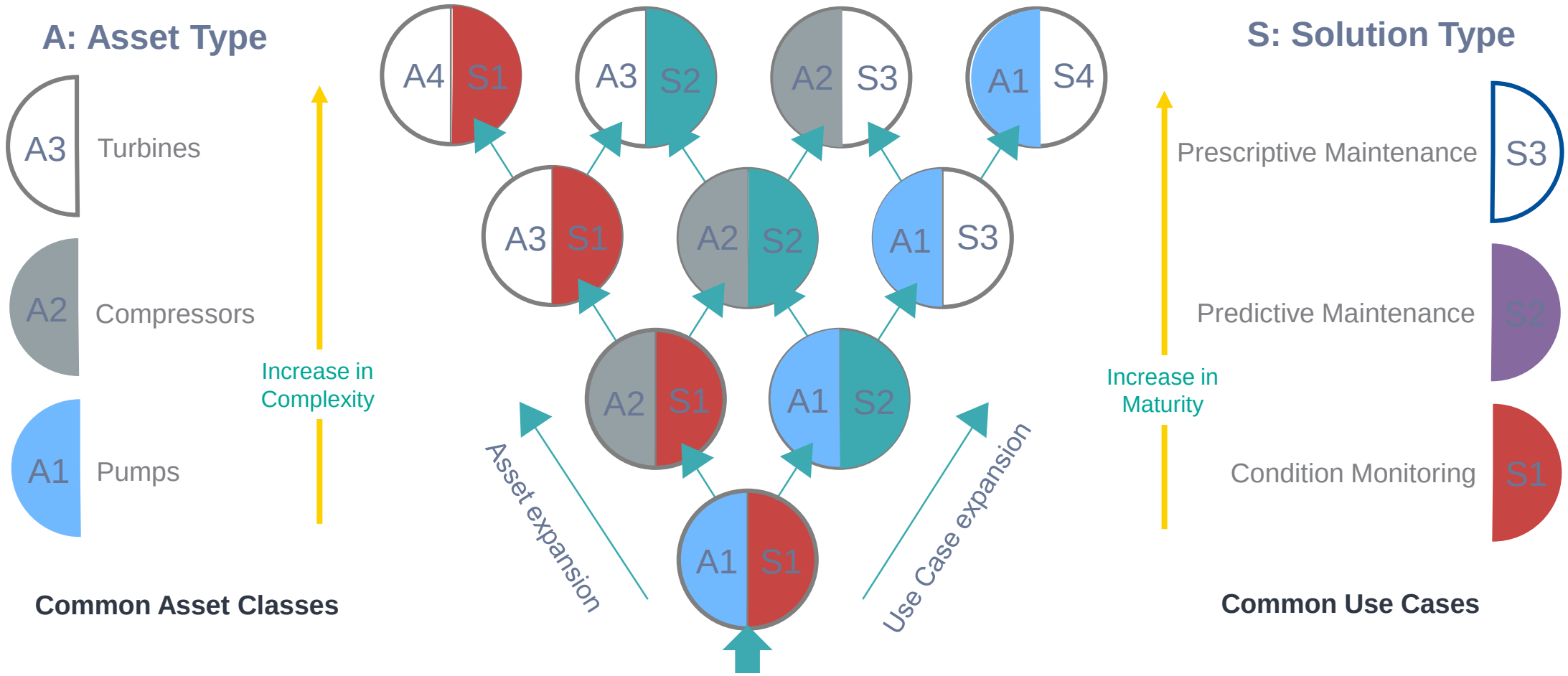


Root Cause Analysis UX

Getting Started

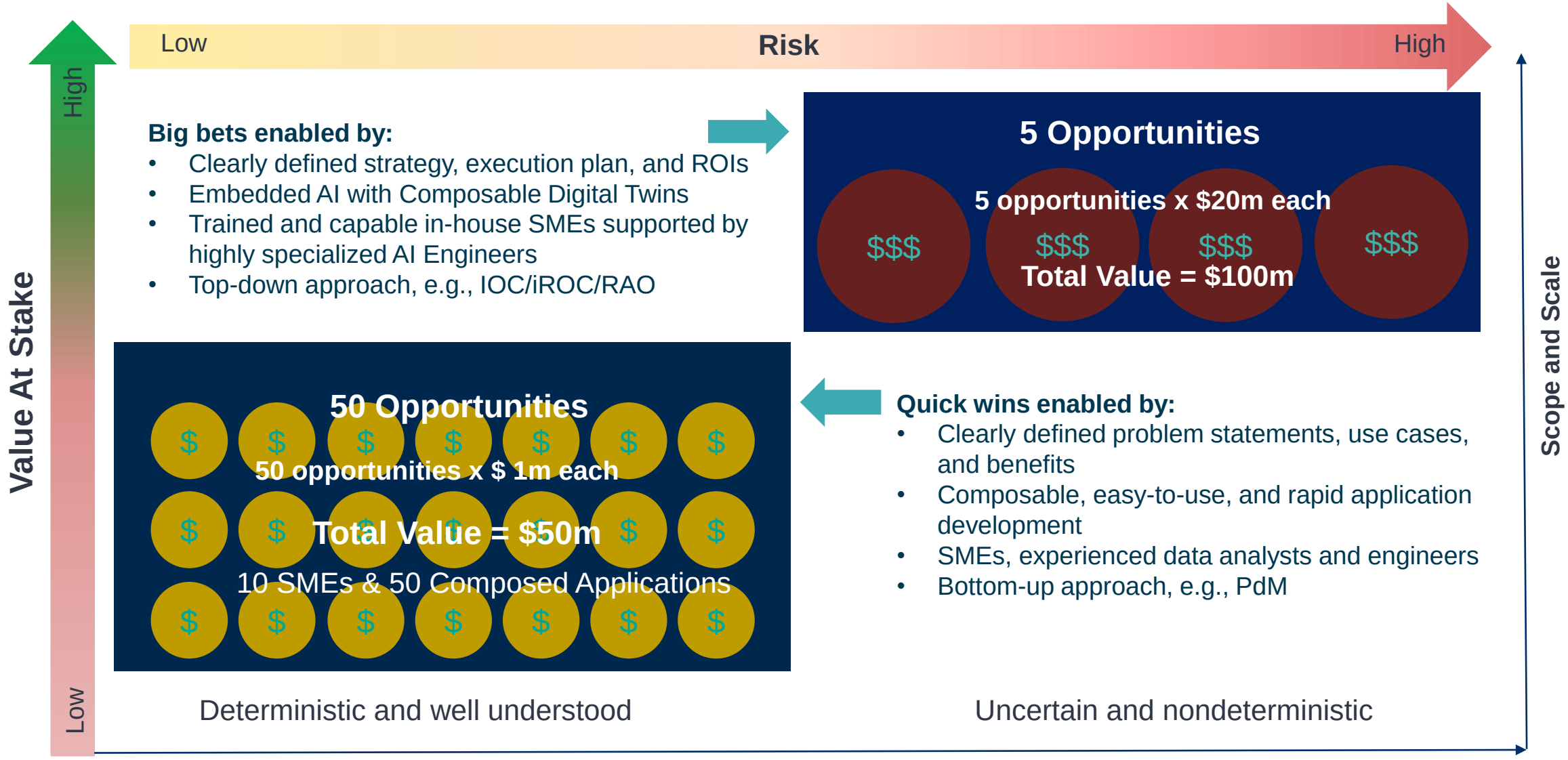
How to Get Started? Bowling Alley Strategy

Think Big, Start Small, and Scale Fast

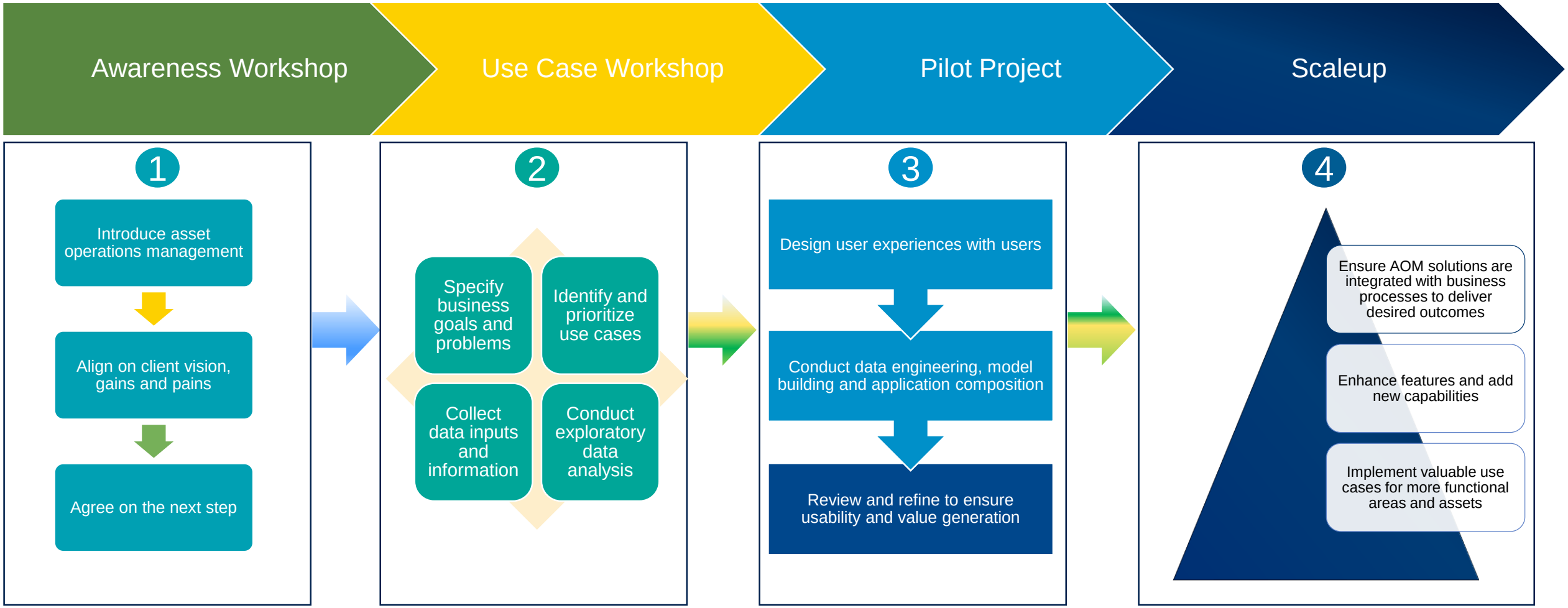


Bad actors, quick wins, high ROI

Project Strategy – Quick Wins and Big Bets



4 Steps to Embarking on a Successful AOM Journey



Summary

Which Areas Can AOM Deliver Value?

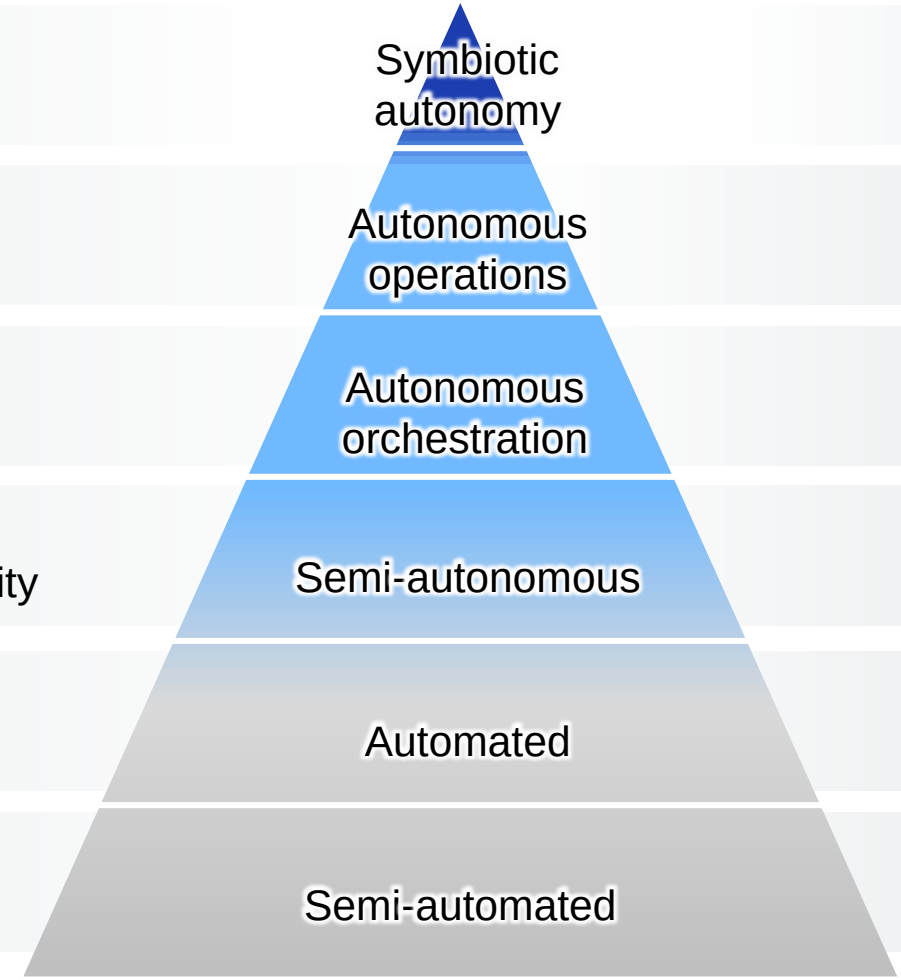
Operational Excellence → Competitive Edge → Future Positioning

Solve Specific Problems	Improve Operational Performance	Gain Strategic Advantages
		
E.g., Unplanned Downtime, Quality Issues	**E.g., Supply Chain Optimization, Energy Efficiency**	**E.g., Remote, Integrated, Autonomous Operations**

AOM aims to make industrial operations efficient, safer, and resilient while lowering carbon footprint and improving profitability. Digital twins and AI are rapidly becoming a mainstay in industrial solutions as companies are embarking on their DX Journey.

Journey to Autonomous Operations

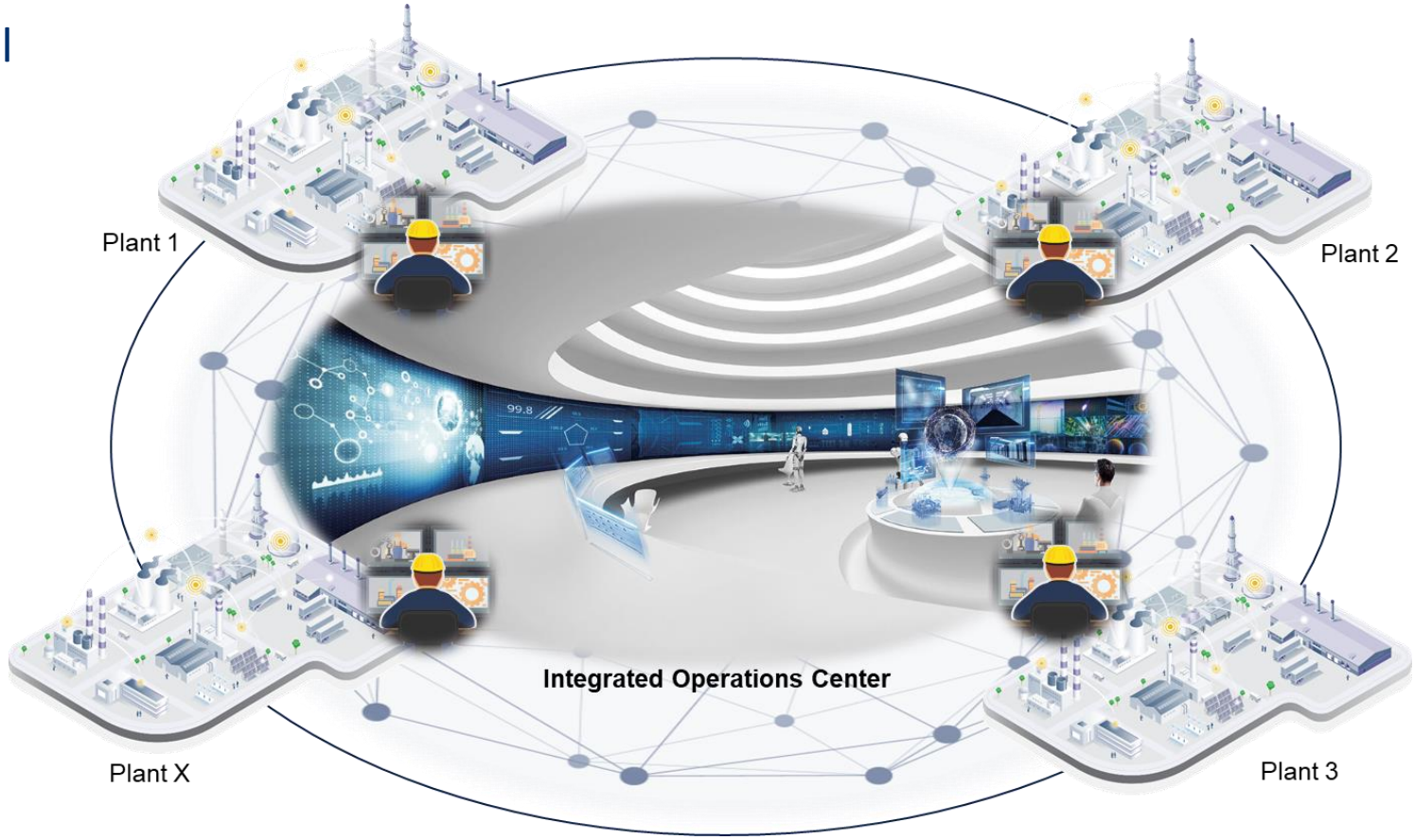
Needs	IA2IA Stages	Benefits
Optimizing multiple ecosystems across industries	Symbiotic autonomy	Enablement of plant-to-planet business (no barriers)
Integrating ecosystems across multiple companies	Autonomous operations	Optimization of the value chain
Integrating different domains and functions	Autonomous orchestration	Capturing of new business opportunities
Breaking down silos to share information and increase profitability	Semi-autonomous	Improved collaboration and optimized production
Leveraging data for real-time decisions to improve efficiency	Automated	Increased productivity and safety
Improving safety, efficiency, availability	Semi-automated	Achievement of safer and more efficient operations



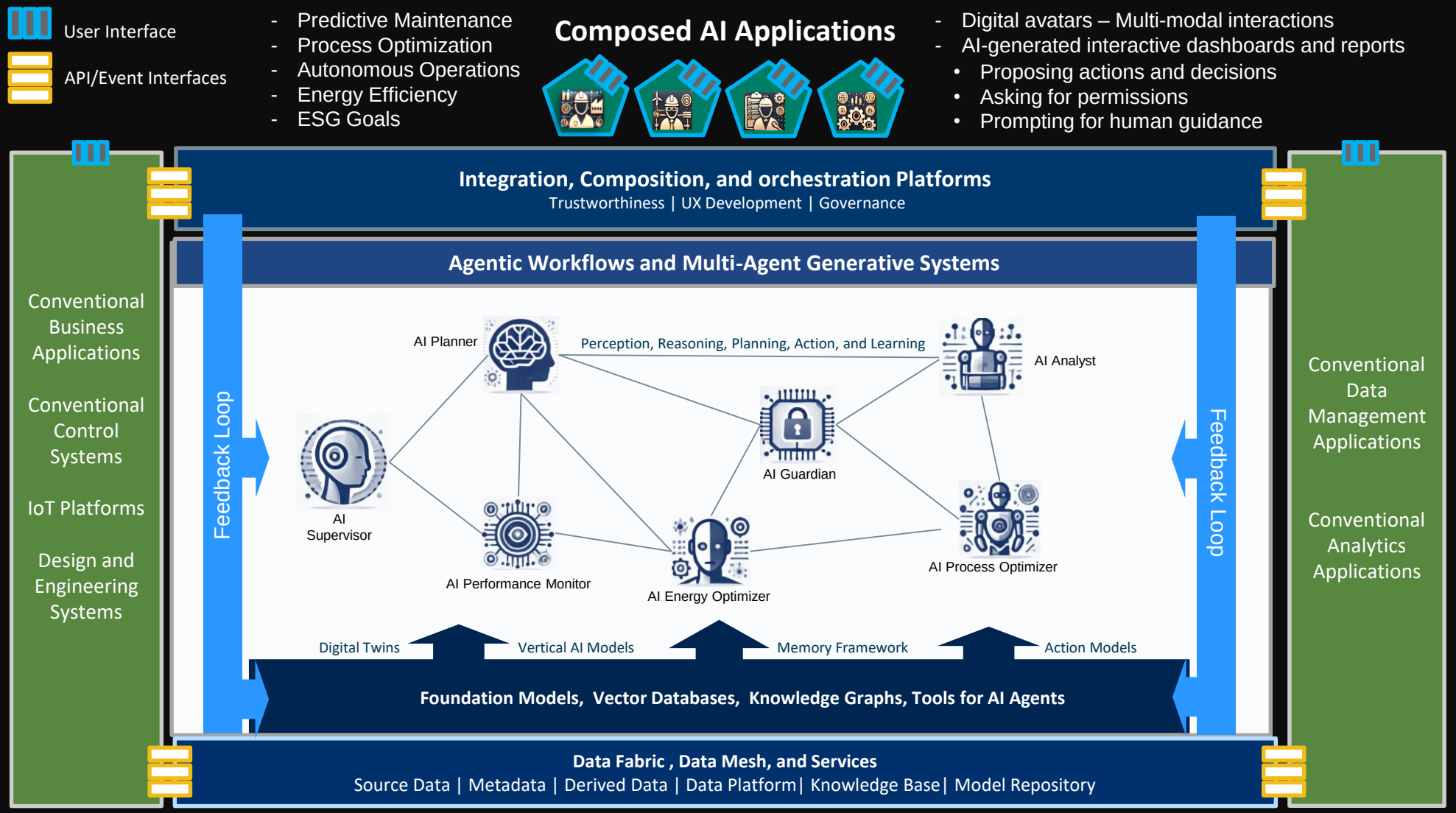
Integrated Operations Center

One or more centralized business workspaces providing an integrated view of an organization's people, processes, and technology

- Knowledge oriented with cross-functional collaboration
- Integrated information sharing to enable fast, high-quality decision making
- Adopt new technology to bring remote connected field workers into regular and ad-hoc IOC workflows
- Situational awareness enables maximum sharing of knowledge across the organization



Agentic Asset Operations Management Architecture



YOKOGAWA

Co-innovating tomorrow™

CENTUM 50th ANNIVERSARY