TwinThread: Digital Twins & AI - The Journey to Autonomous Operations & Continuous Innovation

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Digital Twins & AI
The Journey to Autonomous Operations & Continuous Innovation
The COMPLETE AI-Powered Digital Twin Platform
What is a Digital Twin?

A digital twin is a virtual, real-time representation of a physical asset, system, or process.

The twin can reflect a single asset, a collection of field-based assets, a process within a manufacturing environment, or an entire multisite industrial operation.

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AI-Powered Digital Twin Platform Requirements

- **Rapid Time to Value**: Implement a solution quickly and efficiently prove value as fast as possible

- **Operationalization**: Identify improvement areas and act on insights and recommendations

- **Stability & Longevity**: Maintain the solution without added resource costs or additional work

- **Scalability**: Scale the solution on all equipment, lines, and facilities - across the enterprise
TwinThread Digital Twin Platform Stack

Corporate Data Lake

Enterprise Data Factory: Curated Data Sets
- Application #1
- Application #2
- Application #3

AI Engine: Data Science Factory

Digital Thread Engine: Operationalization

Digital Twin Engine: Contextualization & Visualization

AVEVA Data Hub
IloT Digital Twin Options

- Off-the-shelf software tools, platforms, and packaged applications
- Building your own solution from scratch
- Building components from scratch in combination with tools or platform components from various suppliers
- Stitched together components from a range of suppliers
The Economic Case for AI in Operations

<table>
<thead>
<tr>
<th></th>
<th>impacts @ scale</th>
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<tbody>
<tr>
<td>Energy Intensity</td>
<td>5% - 10%</td>
</tr>
<tr>
<td>Material Losses</td>
<td>1% - 3%</td>
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<tr>
<td>Production / Capacity Increases</td>
<td>2% - 5%</td>
</tr>
<tr>
<td>Yield Improvements</td>
<td>1% - 3%</td>
</tr>
<tr>
<td>Reliability Improvement</td>
<td>5% - 15%</td>
</tr>
<tr>
<td>Quality Improvement</td>
<td>25% - 50%</td>
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Impact @ Scale: 5-8% Gross Margin Improvement - 12x Return On Cash (3yr)
TwinThread’s AI-Enabled Applications

**Virtual Center of Excellence**
Empower your top team members

- Perfect Manufacturing
  - Perfect Energy
  - Perfect Batch
  - Perfect Production
  - Perfect Quality

- Continuous Improvement
  - Uptime
  - Throughput
  - Asset Reliability
  - Asset Life

**AI Engine**
Leverage industry leading AI to accelerate your continuous improvement journey

**Customer Data Sources**

**Data Connection**

**Data Contextualization & Data Enrichment**

**Visualization**

**Customer Data Lake**

**Enterprise Data Factory**
Integrate with corporate data lakes and enterprise workflows
AI and the Journey to Autonomous Operations
How Digital Twins + AI Transform Your Supply Chain

Levels of Autonomous Operations

1. Baseline
2. Anomaly Detection
3. Ideal Recipe Creation
4. Top Driver Identification
5. Automated Diagnosis
6. Operator Assist
7. Autonomous Control

Model Process

Achieve Stability

Increase Capability

Digital Twins

AI

AI

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Composite Models in Action

Autonomous control of key quality parameters in food manufacturing
Data is Your Competitive Advantage

Data + Algorithms = Model

“If you own the data, you own the model produced from that data”
It is Best to “Buy” First, Then “Build”
How Do I Know Which Use Cases to Apply AI?

Characteristics of Ideal Use Cases:

1. Has historical data available: 3 months to 1+ year
   - Reduce Unplanned Downtime by 15%

2. Metric and outcome are well defined
   - Unplanned Downtime is 19% +/- 10% month to month

3. There is high variation in the metric
   - Consider cost of change management

4. Meaningful economic benefit in outcome
   - There is opportunity to scale

5. Same or similar objective across many / all sites or production lines
Maximize Value Realization

- Introduce new use cases to a key plant or key cluster of plants
- Introduce a validated use case to new plants

Vertical Scale

- Value Identified

Horizontal Scale

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# Overcoming Barriers to Scaling AI Use Cases

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<th>Problem</th>
<th>Solution</th>
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<tbody>
<tr>
<td>Inconsistent [tag] naming line to line</td>
<td>Digital Twins</td>
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<tr>
<td>Different lines have different equipment</td>
<td>Automated “AI Ops”</td>
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<tr>
<td>Configuration burden at scale</td>
<td>Digital Twin Classes</td>
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<tr>
<td>Storage and Compute burden at scale</td>
<td>Automated “Data Ops”</td>
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<tr>
<td>Lack of skilled / experienced resources</td>
<td>Virtual Center of Excellence</td>
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The Virtual Center of Excellence (VCoE) and a Modern Continuous Innovation Process
Just 3% of manufacturers are fully future-built

Most manufacturers have significant work ahead; only 16% are scaling their efforts to build for the future, and just 3% are fully future-built

Source: BCG Build for the Future Survey 2023, n = 724.

Notes:
- Advanced = future-built
- Scaling = scaling
- Stagnating = stagnating
- Emerging = emerging
- Manufacturing oriented sectors: machine and automation, consumer products, oil and gas, medtech, transport and logistics, biopharma, auto and mobility, hardware and semiconductors, materials and process industries.

The foundational dimensions for factory of the future success directly align with the six key attributes that enable a future-built company

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<td>1</td>
<td><strong>Align leadership around a corporate purpose</strong>, particularly sustainable manufacturing.</td>
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<td>2</td>
<td><strong>Develop a clear people advantage</strong> by attracting, upskilling, and retaining top talent and building the capabilities to drive innovation, operational excellence, and exceptional customer satisfaction.</td>
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<td>3</td>
<td><strong>Institute an operating model to enable agility and resilience</strong>, making supply chains more responsive and durable to efficiently deliver products.</td>
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<tr>
<td>4</td>
<td><strong>Establish an innovation-driven culture</strong> by empowering employees to explore emerging technologies, leverage analytics, and apply advanced solutions to improve operations.</td>
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<tr>
<td>5</td>
<td><strong>Embed AI</strong> in the organization to increase transparency, analyze performance, forecast more accurately, and optimize production.</td>
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<tr>
<td>6</td>
<td><strong>Migrate to modernized tech platforms</strong>, including scalable infrastructure to leverage the power of manufacturing data and capitalize on advanced technologies such as AI.</td>
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*Source: BCG Build for the Future Survey 2022, n = 724.*

Digital Manufacturing Transformation

- **Digital Maturity**
  - **Digital Novice**
    - Decentralized: Sites, regions, or business units develop processes and implement technology independently.
  - **Digital Leader**
    - Centralized: Central management of technology and processes, with individual site or business unit flexibility.
    - Innovation-Driven: Specialized project teams develop and implement technology with central oversight on processes.

- **Digital Strategy**
  - Centralized: Centralized management of processes and technology with limited flexibility for individual sites.
The Virtual Center of Excellence brings multiple teams together with a shared mission and shared operational context.

The Virtual Center of Excellence is the command center for coordinating a modern, scalable Continuous Innovation Process.
Continuous Improvement will always be an important concept for industrial operators. How this concept is approached; however, is positively evolving in the age of AI.

Digital Twins accelerate the speed at which improvements are identified, prioritized and implemented by leveraging AI powered data insight generation capabilities and the enablement of advanced collaboration through TwinThread’s Virtual Center of Excellence.

Insights and use cases identified at a single plant, along with the resultant optimized business processes, are shared across plants, positively impacting all applicable operations.

The VCoE is responsible for comparative analytics which aid in the identification of opportunities and best practices, driving increased scale and value across the organization.
Key Takeaways

1. Digital Twin, powered by AI, is the foundation
2. Rapid time to value, operationalization, sustainability and scalability are key
3. Requires a complete platform stack
4. Protect your data and your competitive advantage
5. Promote a continuous innovation mindset
6. Build from a foundation of fit-for-purpose AI enabled applications
7. Connect successful Innovation projects with a separate Scaling process
Please remember to...

Navigate to this session in the mobile app to complete the survey.

Questions?

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