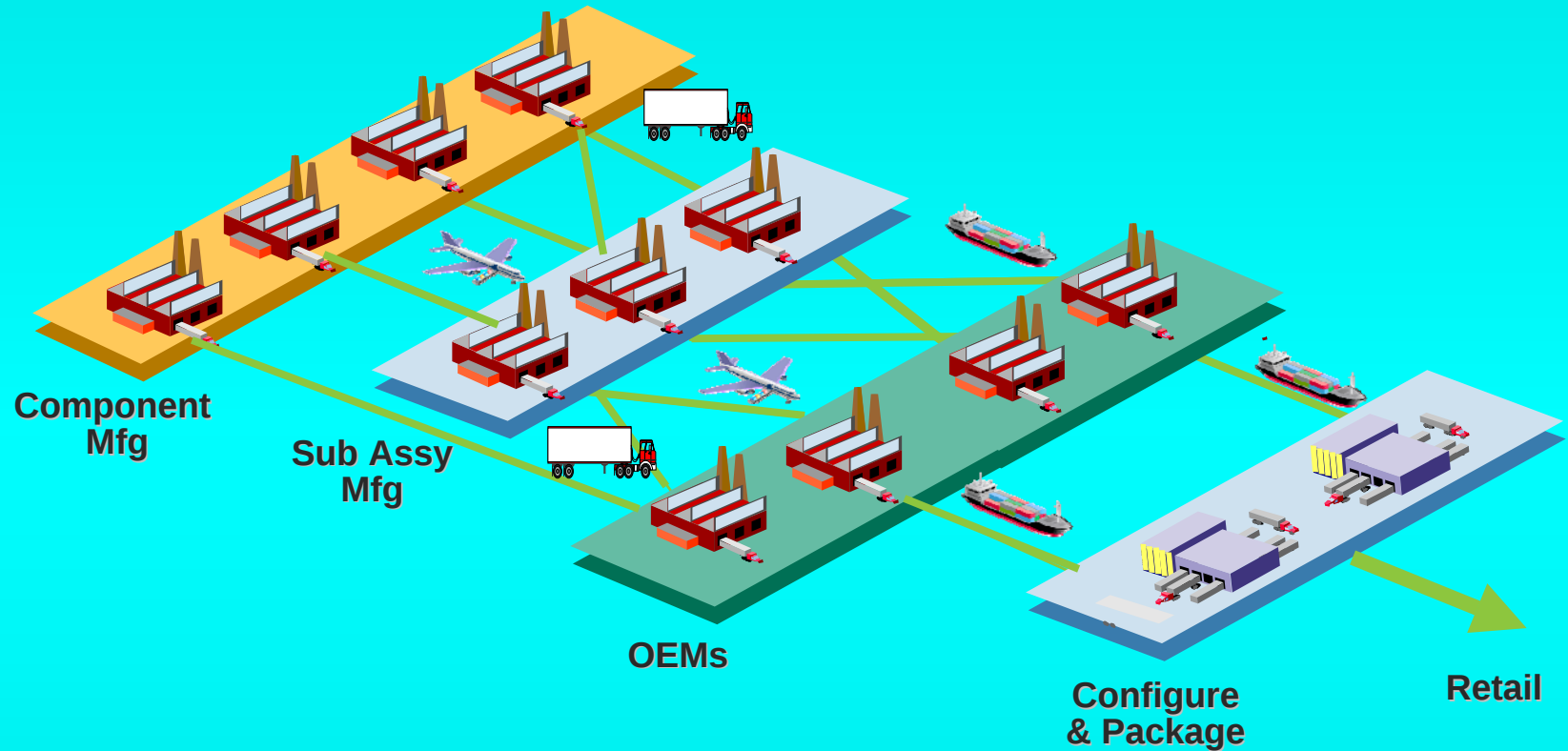




Manufacturing in the Real-Time World

- *Bharat Nair*
- *Industry Director, Brooks Software*

High Tech Value Chain: Complex and Growing

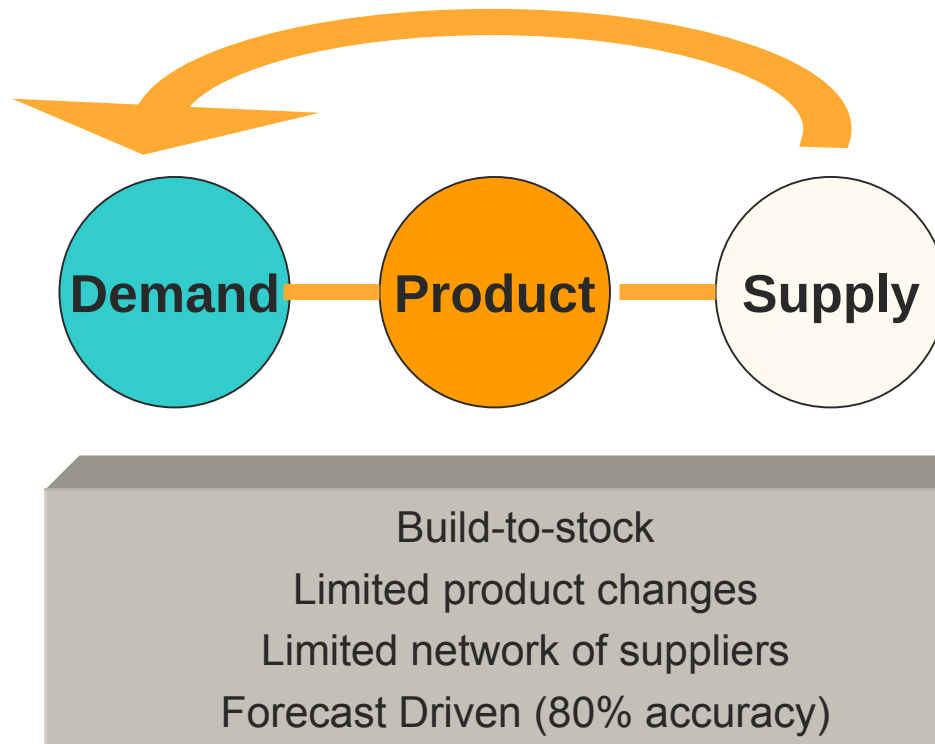




Change Drivers and Pain Points

Lean Initiatives

- Focus on Process Changes
- Elimination of Waste
- Focus on the factory



New Change Drivers

■ Demand Side

- Increased velocity of change
- Channel proliferation
- Global market place

■ Supply Side

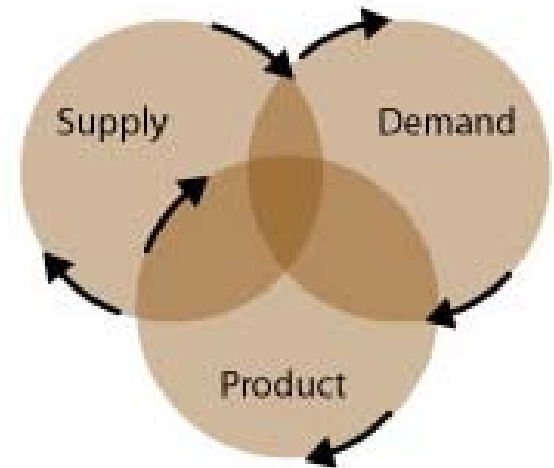
- Increasing complexity in supply network
- Transportation and Logistics

■ Product Challenges

- Increased mix
- Reduced life cycle → capture market window
- Quality → Cost of Poor Quality

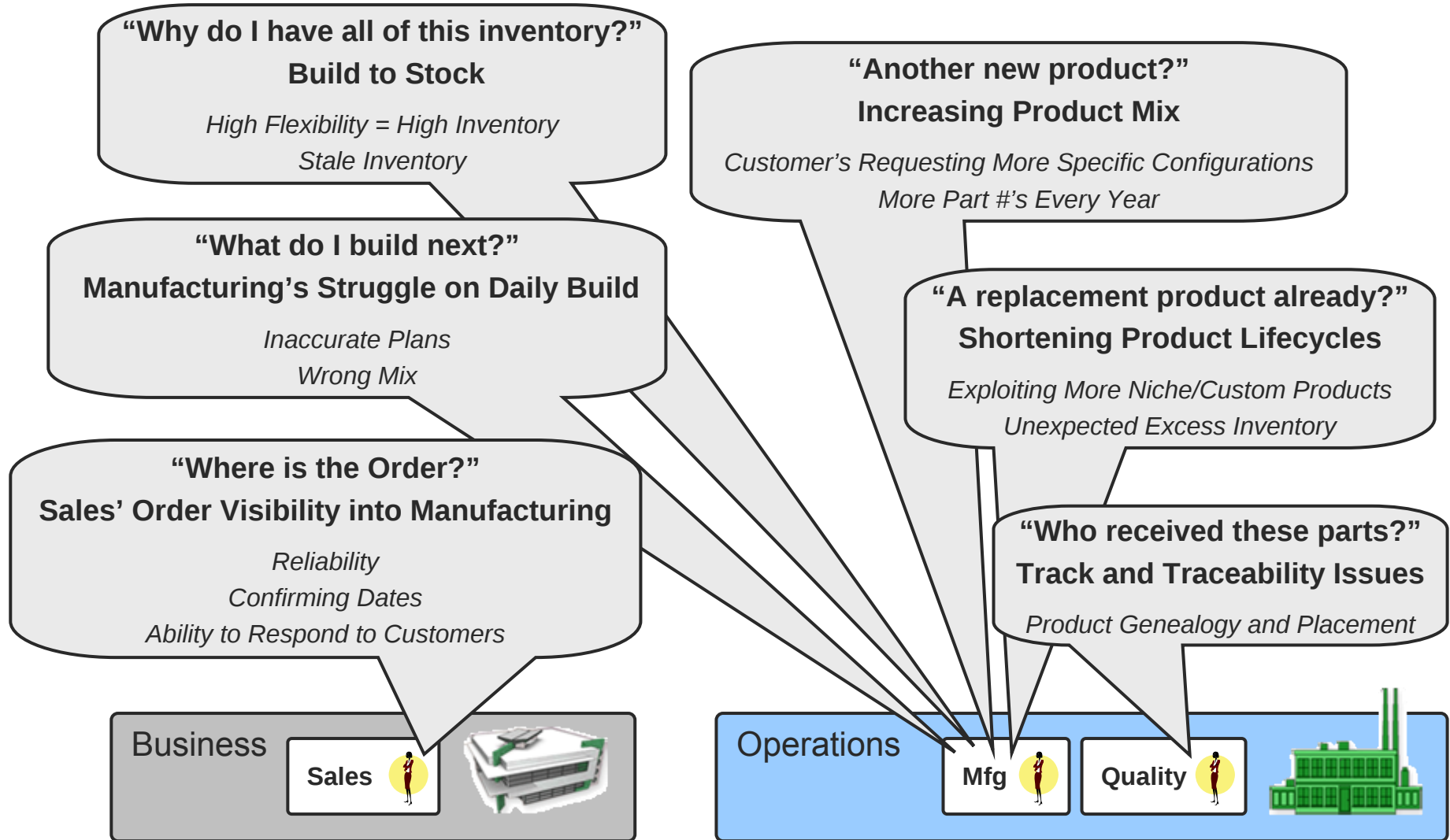
■ Compliance

- Government and Regulatory bodies
- Channel and Brand owners



AMR Research

Pain Points





Role of Manufacturing

Adapting to new business drivers

Forecast Driven

Variability is “Enemy”

Keep the Stability of Business

Maintain the Market Share

Synchronization of processes

Demand Driven – Adaptive and Agile

Embracing Variability

Managing the Business Initiatives

Increase the 2% or 4 % Market Share

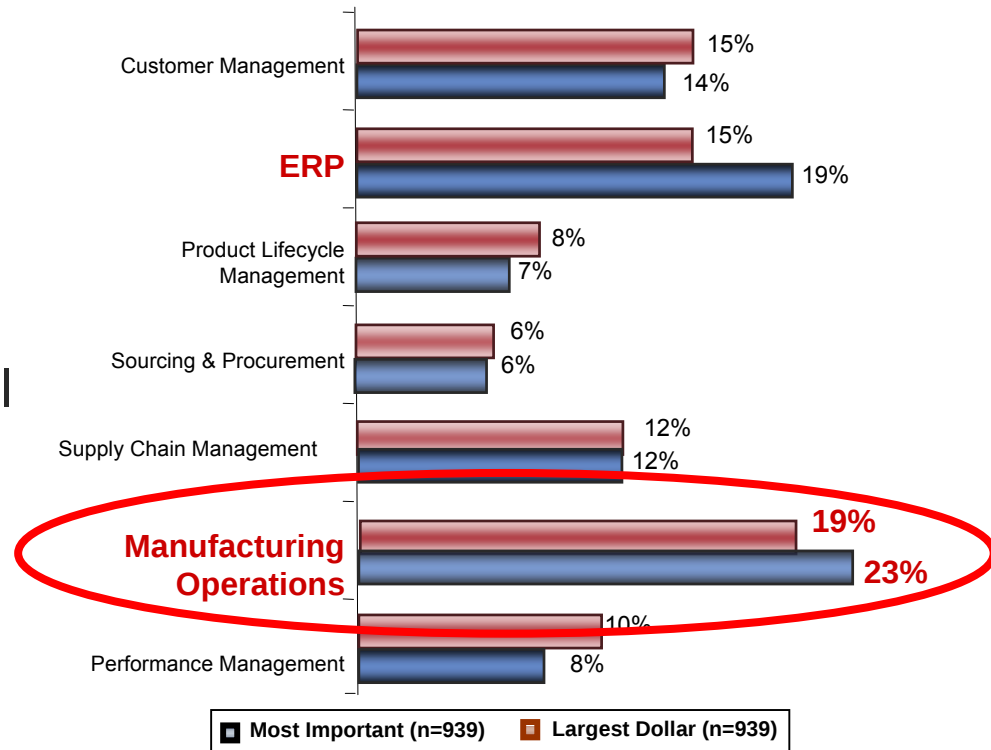
Asynchronization of processes

What it means on the factory floor

- Frequent changeovers on the factory floor
- New processes and procedures
- Retraining and retooling
- Frequent and shorter cycles of learning
- Improve quality and conformance
- Maintain customer commitments despite everything.....

New Systems Thinking

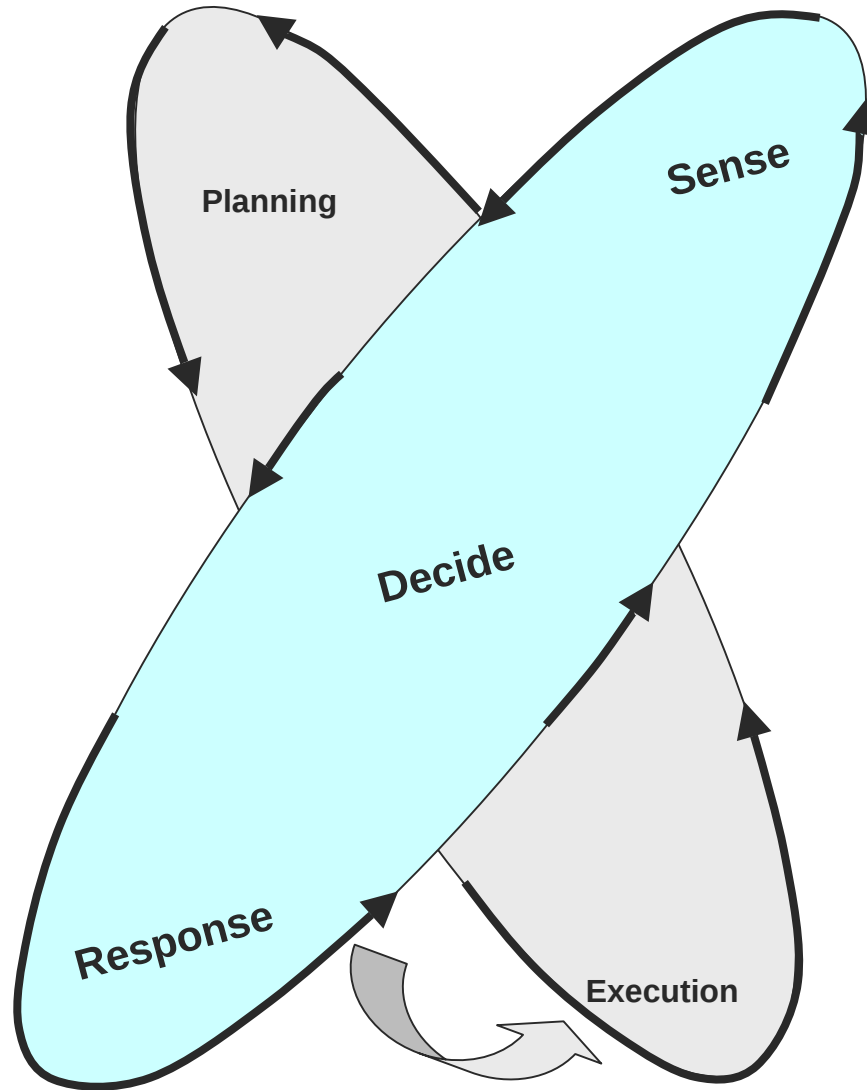
- Interoperable
- Service Oriented
- Closed Loop Execution Control
- Best Practices Based Deployment
- Leverage as much



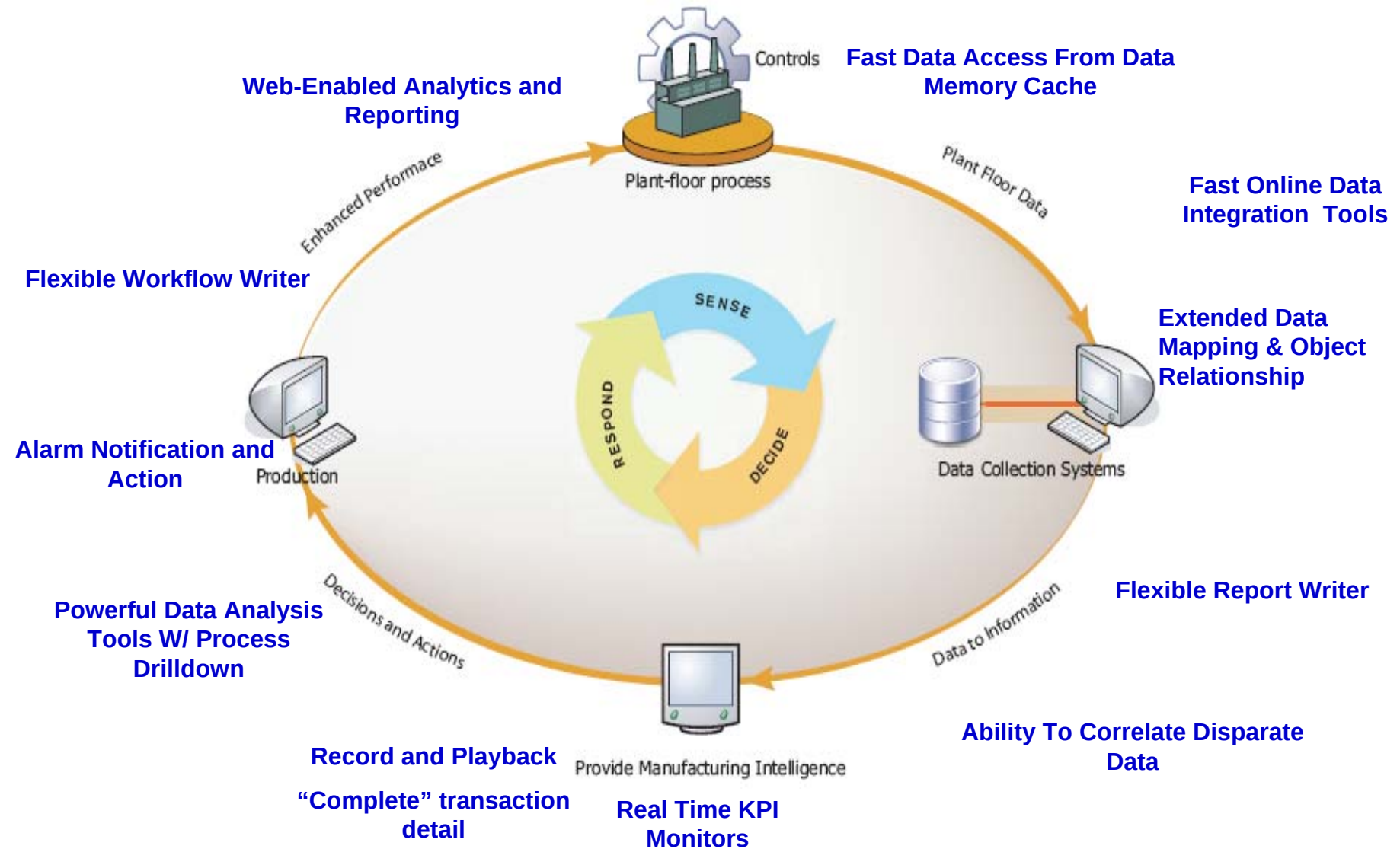
Source: AMR Research 2006 Application Spending Survey

Manufacturing Operations Rank #1 in 2007, compared to #2 in 2006

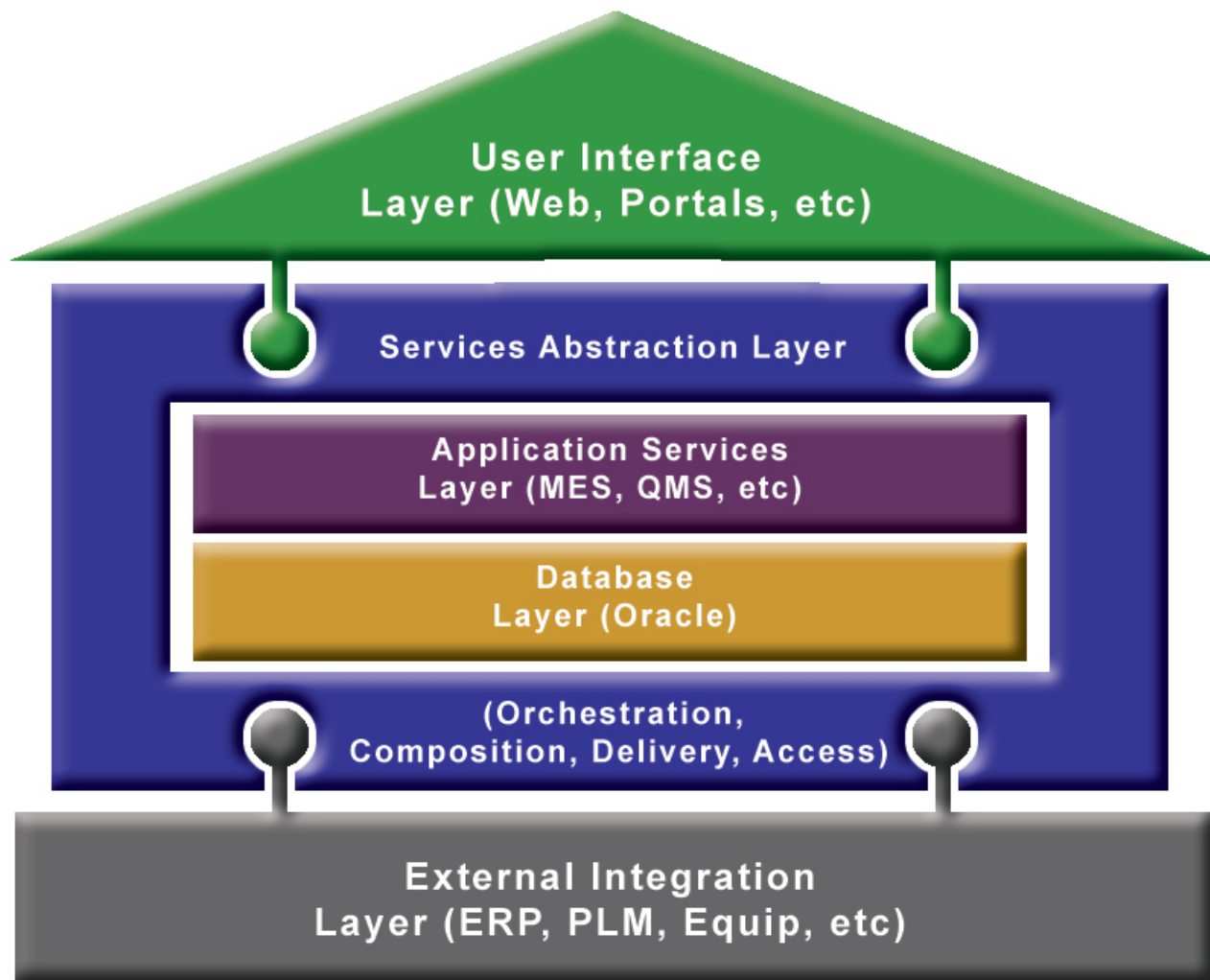
Closed Loop Cycle of Enterprise



Sense-Decide-Respond: Close Loop Capability



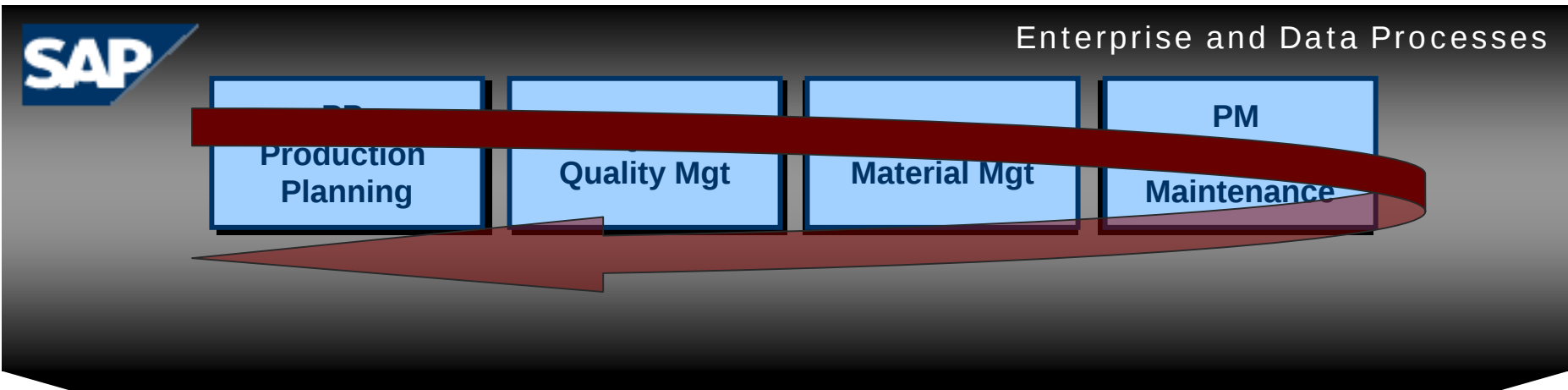
Flexible: Service Oriented Architecture



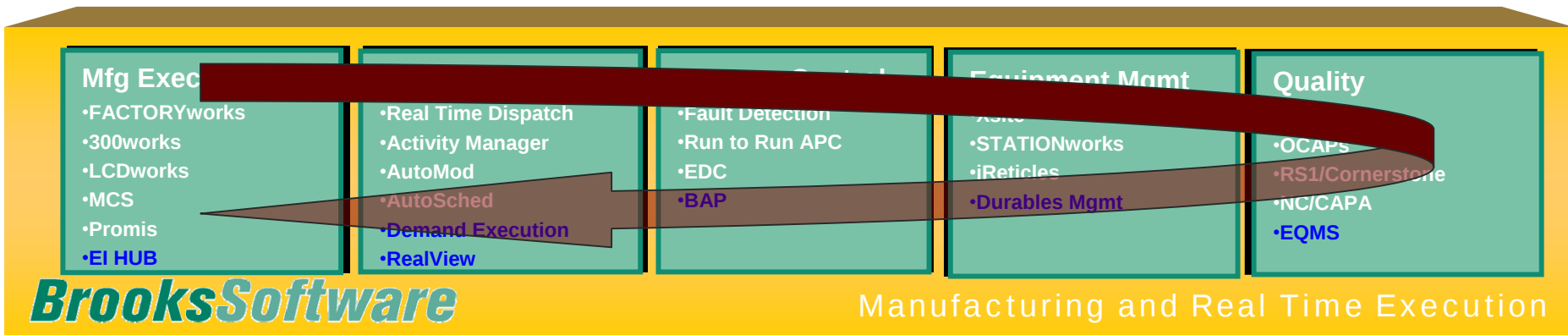


Composite Applications

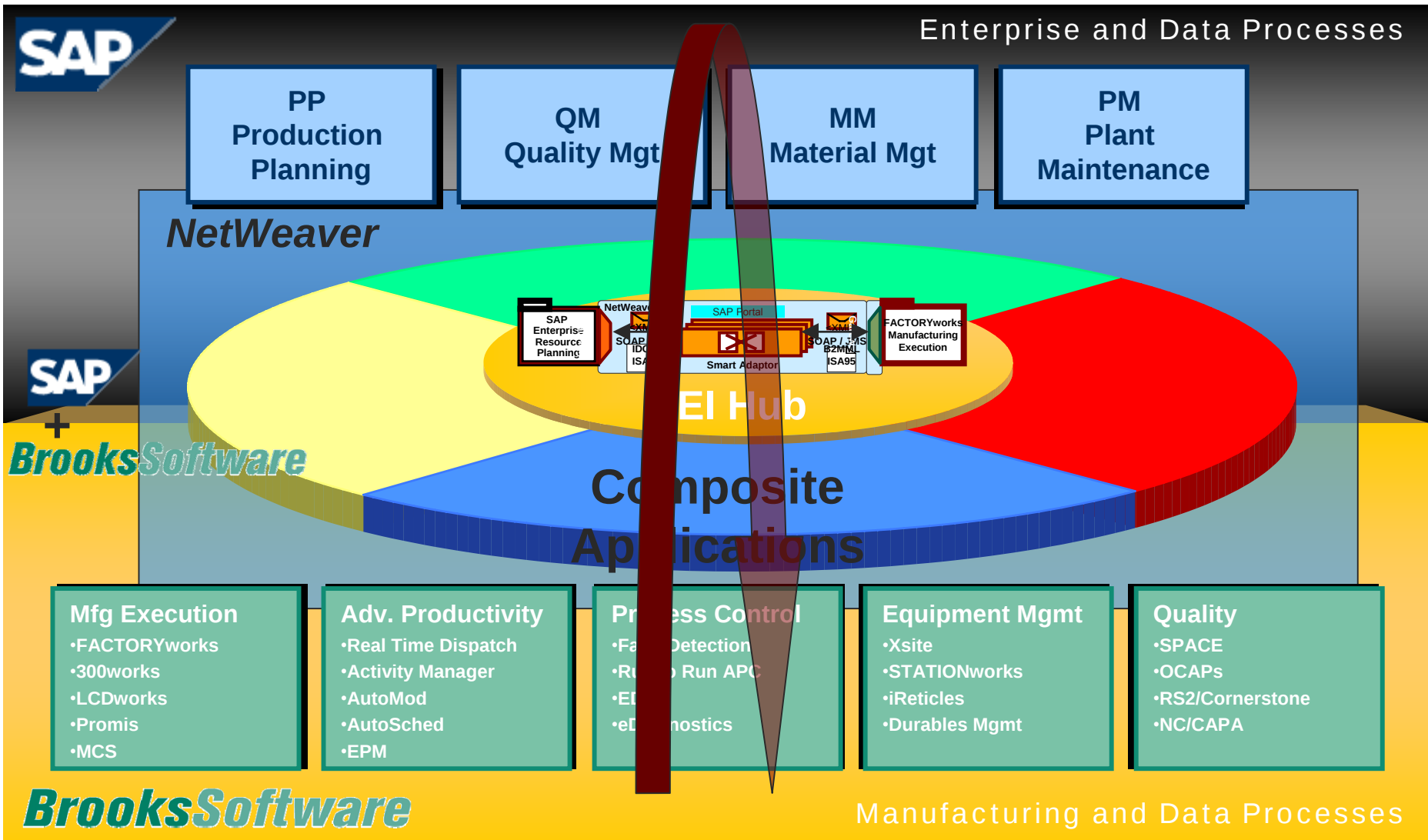
Enterprise Performance Gap



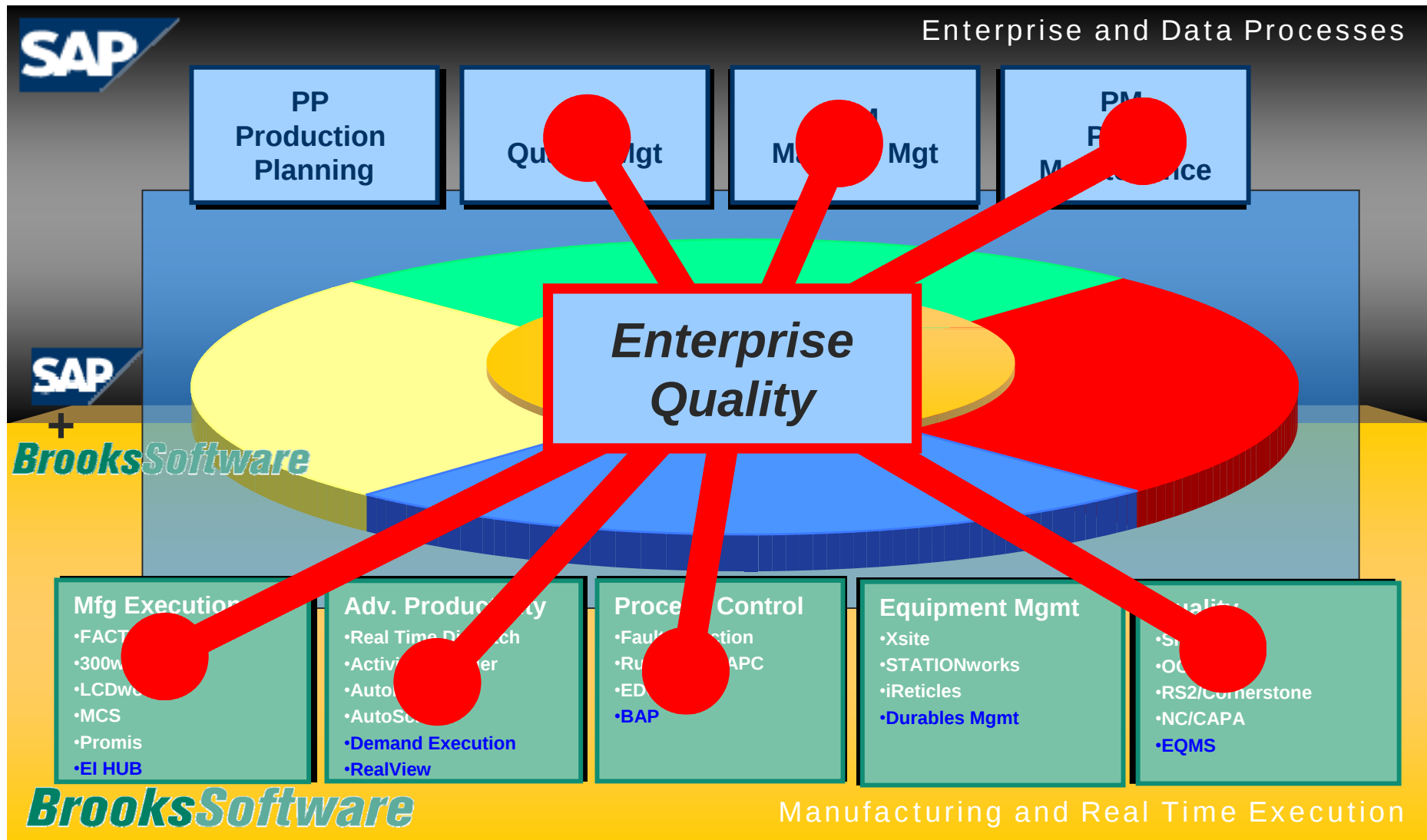
GAP



Brooks Composite Applications



Enterprise Solutions





Solutions and ROI

Plant profitability/ROI: ERP AND Intelligent MES

- Industry Week Benchmark – Profitability, Productivity, Effectiveness
 - Premier manufacturing plants strategically utilizing MES
 - Improve over 400% higher gain in profitability from those that don't integrate MES
 - 630% improvement in Rev/Sq Ft
 - 200% greater improvement in sales/employee
- 27% greater Mfg cycle time reductions

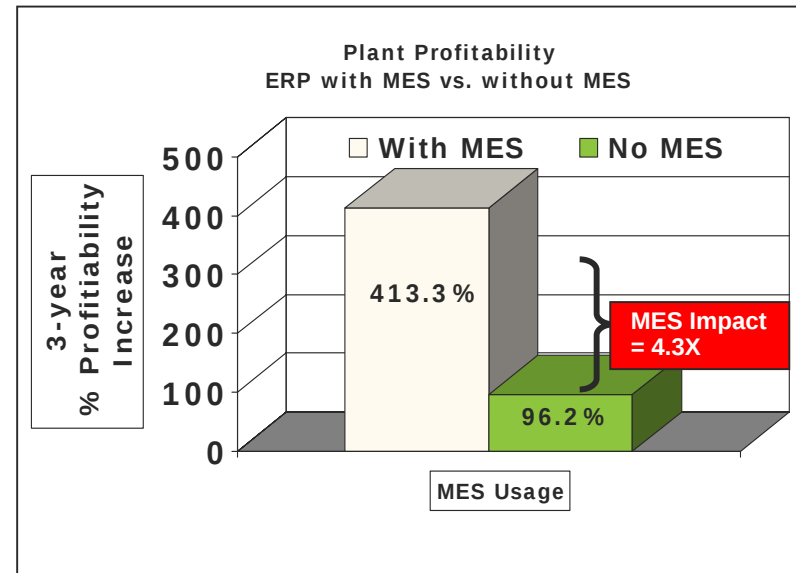
Brooks Software – ROI **Honeywell**

WIP Reduction - WIP reduced by 77% in 9 months

Increased Inventory Turns - From 12 at peak reduced to 6

Cycle Time Reduction - Manufacturing cycle time cut from 60 to 18 days

Integration - Ten plants in '05 integrated to SAP R3 to support real-time production management



•Industry Week- Best Plants Analysis Q1 2004

Proven ROI across discrete manufacturing

Semiconductor Manufacturer:

- 50% reduction in cycle time variability
- 40% reduction in cycle time
- 15% more product output

Discrete Manufacturer:

- 50% reduction in direct labor
- 25% improvement in throughput
- Cycle time reduction from 13 weeks to 2.2 weeks
- Paperless facility

Defense Contractors:

- "Predicted yield improvement of 2% has been transformed into an actual 5%,"

Automotive supplier:

- 45% reduction in cycle time variability



Solutions for the Manufacturing Enterprise

■ Perfect Order Management

- Improved real-time manufacturing visibility to help reduce manufacturing variability. Synchronize enterprise plan with factory events in real time to improve perfect order fulfillment.

■ Enterprise Asset Management

- Improved return on assets through real-time visibility and closed loop control of key assets resulting in optimized manufacturing operations management and enterprise interoperability.

■ Enterprise Quality Management

- Closed loop automation across the enterprise value chain for quality processes and procedures to accurately measure and reduce Cost of Quality.

■ Manufacturing Operations Management

- Integrated product and process management to track and trace material, machines, and tools with real time integration with ERP systems.

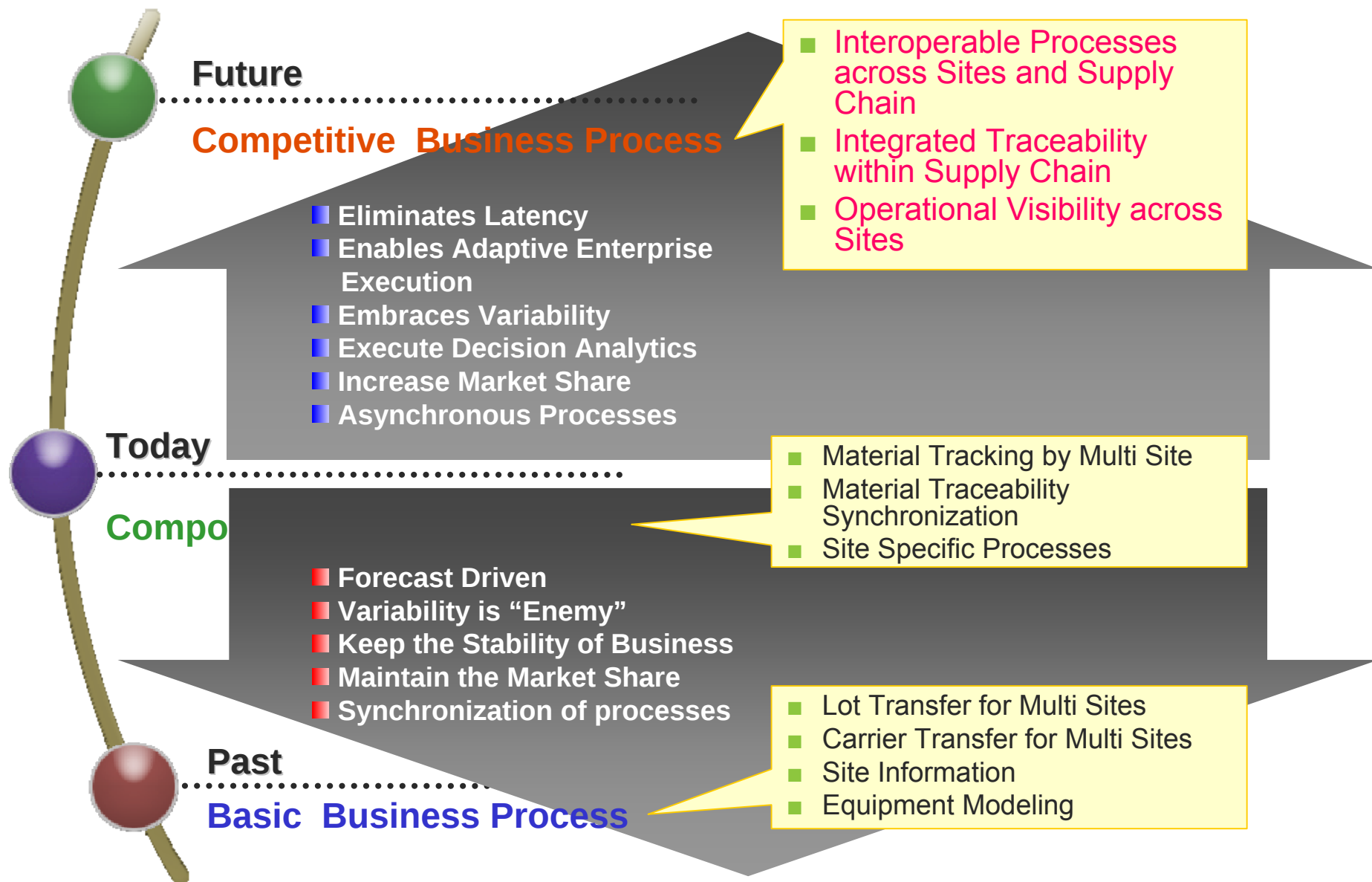
■ Manufacturing Intelligence

- Improved KPI based closed loop factory visibility and execution control in real-time. Provides analytics and improved problem resolution capability across enterprise divisions.



Global Operations

Global Operation Processes

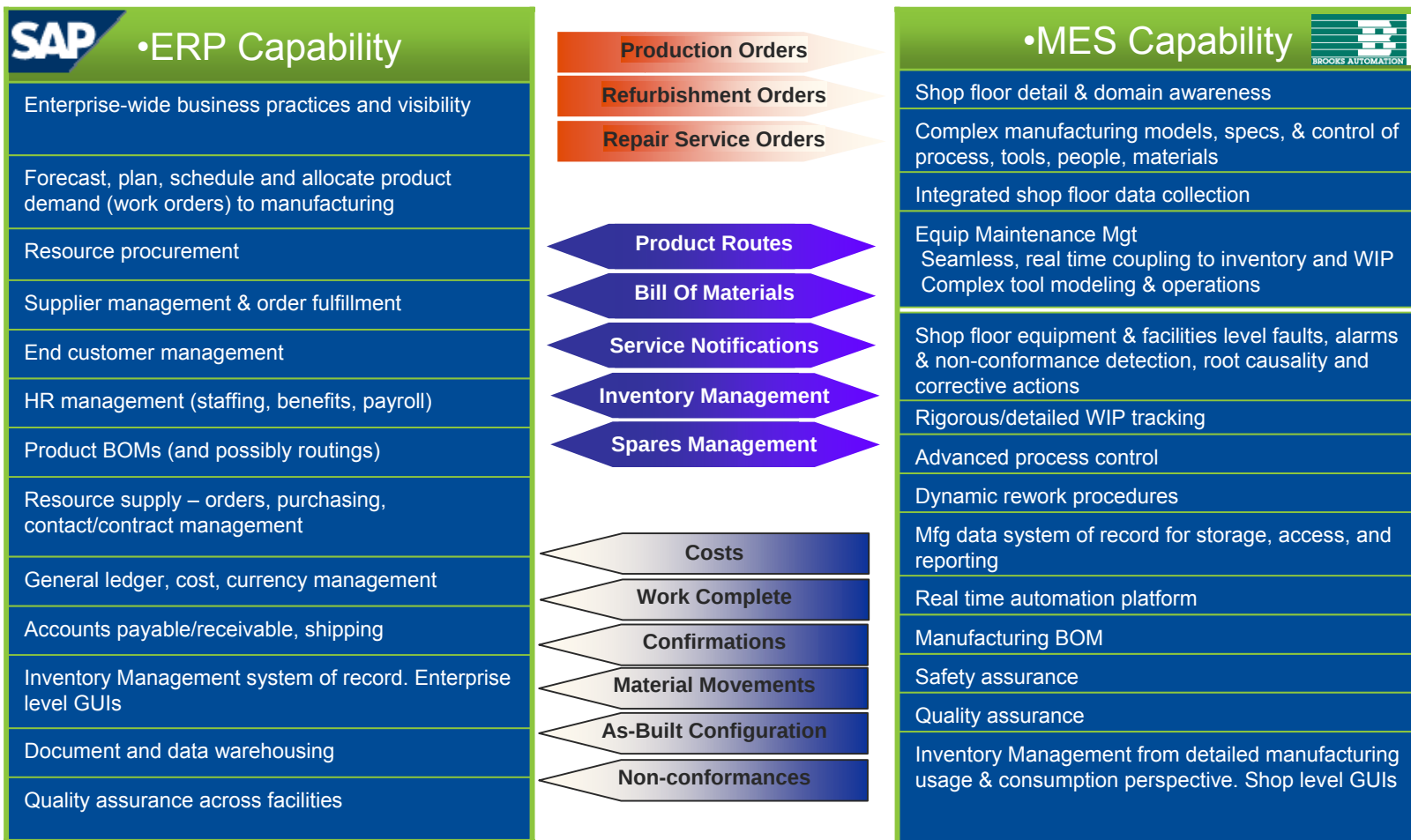


Global Operations

- Data Models for Global Operation
 - Standard and Interoperable Metadata Model
 - Embedded “Traceability” within Supply Chain
- Operational Processes for Global Operation
 - Interoperable Processes by Multi Sites
 - Maintain Traceability within Supply Chain
 - Renovate Deployment
- Knowledge Management for Global Operation
 - Patterning client behaviors for Knowledge collection
 - Governing end-users behaviors for Quality Tracking and Control
- Resource Centric Measurement for Global Operation
 - Productivity (OEE) and Cost of ownership (CoO)
 - Asset Productivity Management

Integration of ERP with MES

Key Interactions





BrooksSoftware | *Sense Decide Respond™*

Solutions for the Real Time Enterprise