Plant Reliability in Dollars & $ense

Creating a Competitive Advantage with Reliable Asset Management

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Principle

Editor – The RAM Review

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Presentation Overview

- Asset Management and Strategy
- Reliability Engineering Principles
- Design for Reliability
- Operate for Reliability
- Maintain for Reliability
- Human Factors of Reliability
- Breaking Down the Silos
- Execute Reliability Excellence

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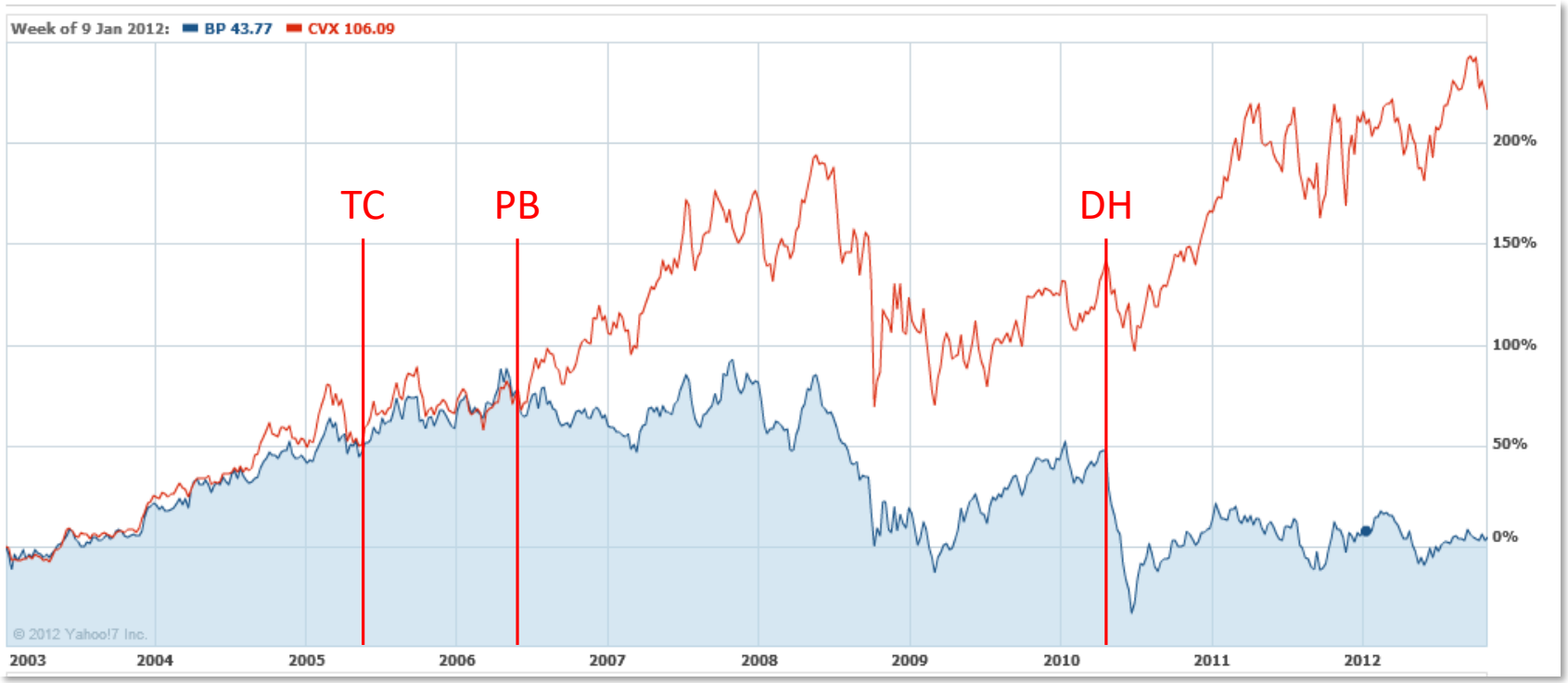
EAM Winners and Losers - BP vs. Chevron Since 2003



TC = Texas City Explosion
PB = Prudhoe Bay Leak
DH = Deepwater Horizon (Macondo) Disaster

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Plant Reliability in Dollars & $ense

Data from Aberdeen Group Research	Reactive Maintenance Scenario	Routine Preventive Maintenance Scenario	Managed Lean Plant Reliability Scenario
Asset Availability	81.80%	87.20%	88.80%
Asset Yield	79.20%	81.90%	84.20%
Maintenance Cost as a Percent of Sales	23.50%	20.80%	17.20%
"What if" Analysis...			
Sales	$1,000,000,000	$1,102,356,079	$1,154,108,320
COGS (Assume 60%)	$600,000,000	$661,413,647	$692,464,992
Maintenance Cost	$235,000,000	$229,290,064	$198,506,631
Overheads	$100,000,000	$100,000,000	$100,000,000
Total Costs	$935,000,000	$990,703,712	$990,971,623
EBIT	$65,000,000	$111,652,367	$163,136,697
EBIT as Percent of Reactive Scenario	100%	172%	251%
Tax Burden (Assume 30% Profit)	$19,500,000	$33,495,710	$48,941,009
Net Operating Profit After Taxes (NOPAT)	$45,500,000	$78,156,657	$114,195,688
Net Assets Employed	$600,000,000	$600,000,000	$600,000,000
Return on Net Assets (RONA)	7.6%	13.0%	19.0%
Weighted Average Cost of Capital (10% Rate)	$60,000,000	$60,000,000	$60,000,000
Economic Value Added (EVA)	-$14,500,000	$18,156,657	$54,195,688
Shares Outstanding	25,000,000	25,000,000	25,000,000
P/E Ratio	12	12	12
Share Price	$31	$54	$78
Market Capitalization	$780,000,000	$1,339,828,406	$1,957,640,365

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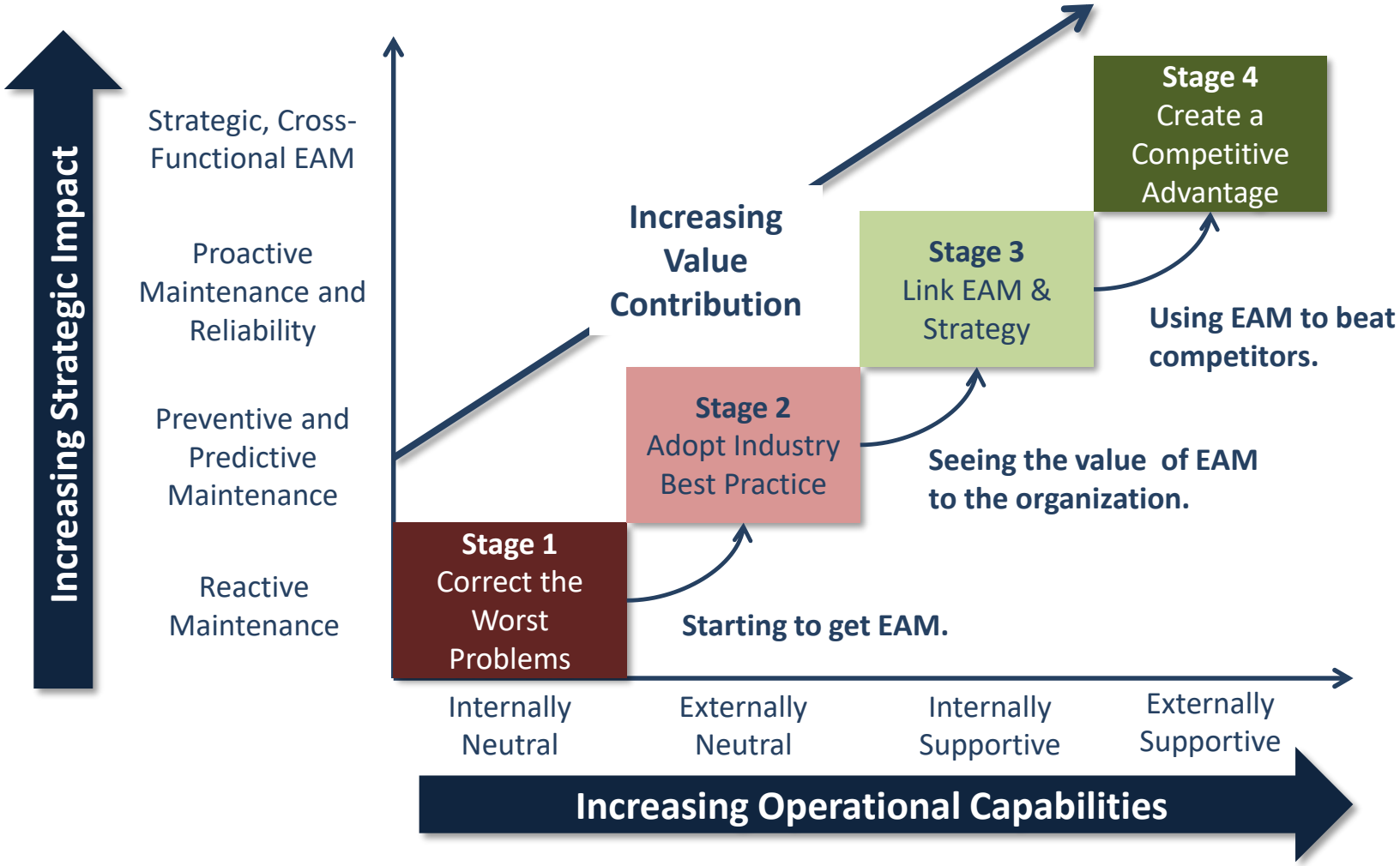
EAM Adaption of the Hayes & Wheelwright Operations Excellence Model



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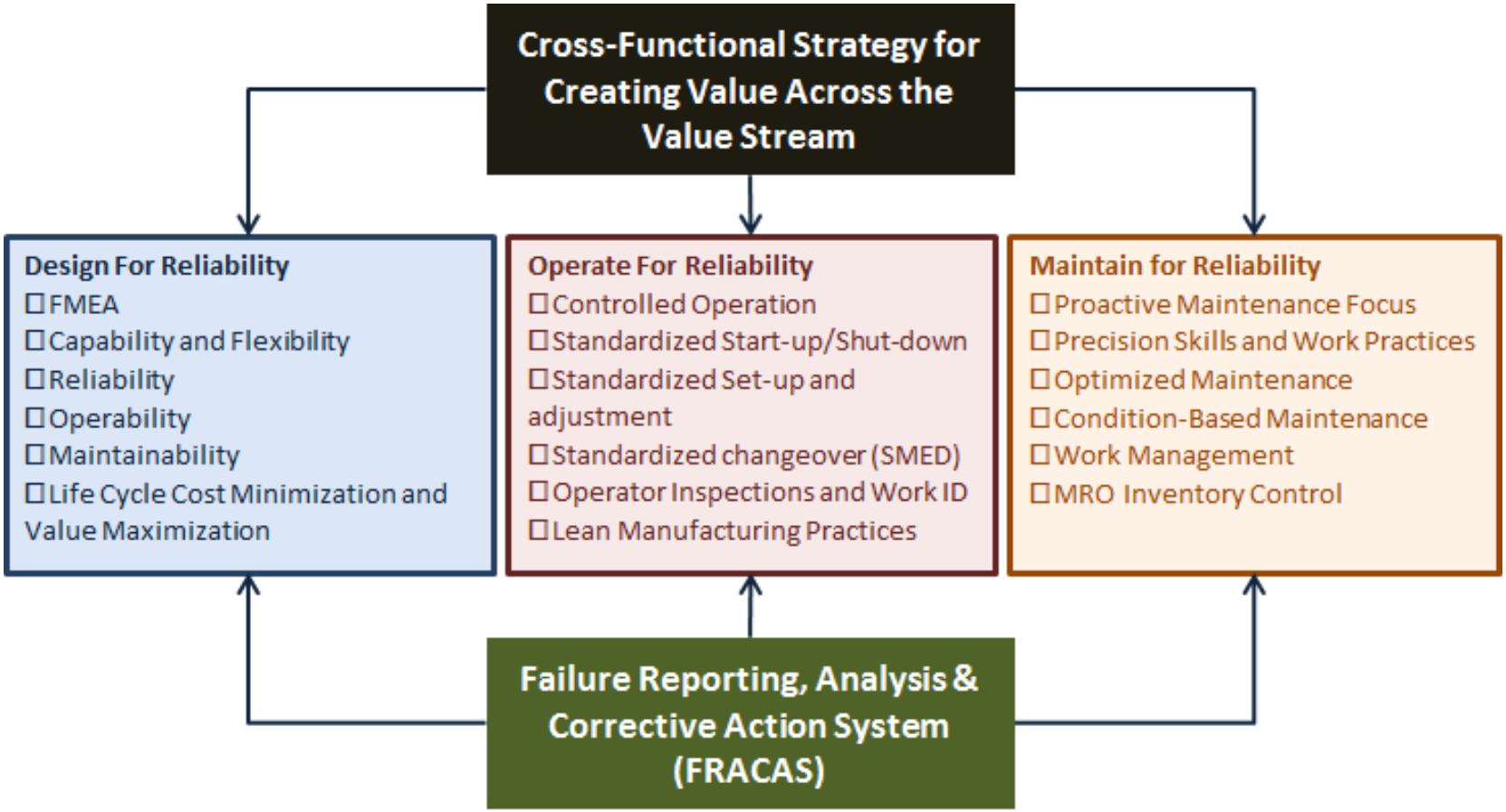
EAM Functional Activities



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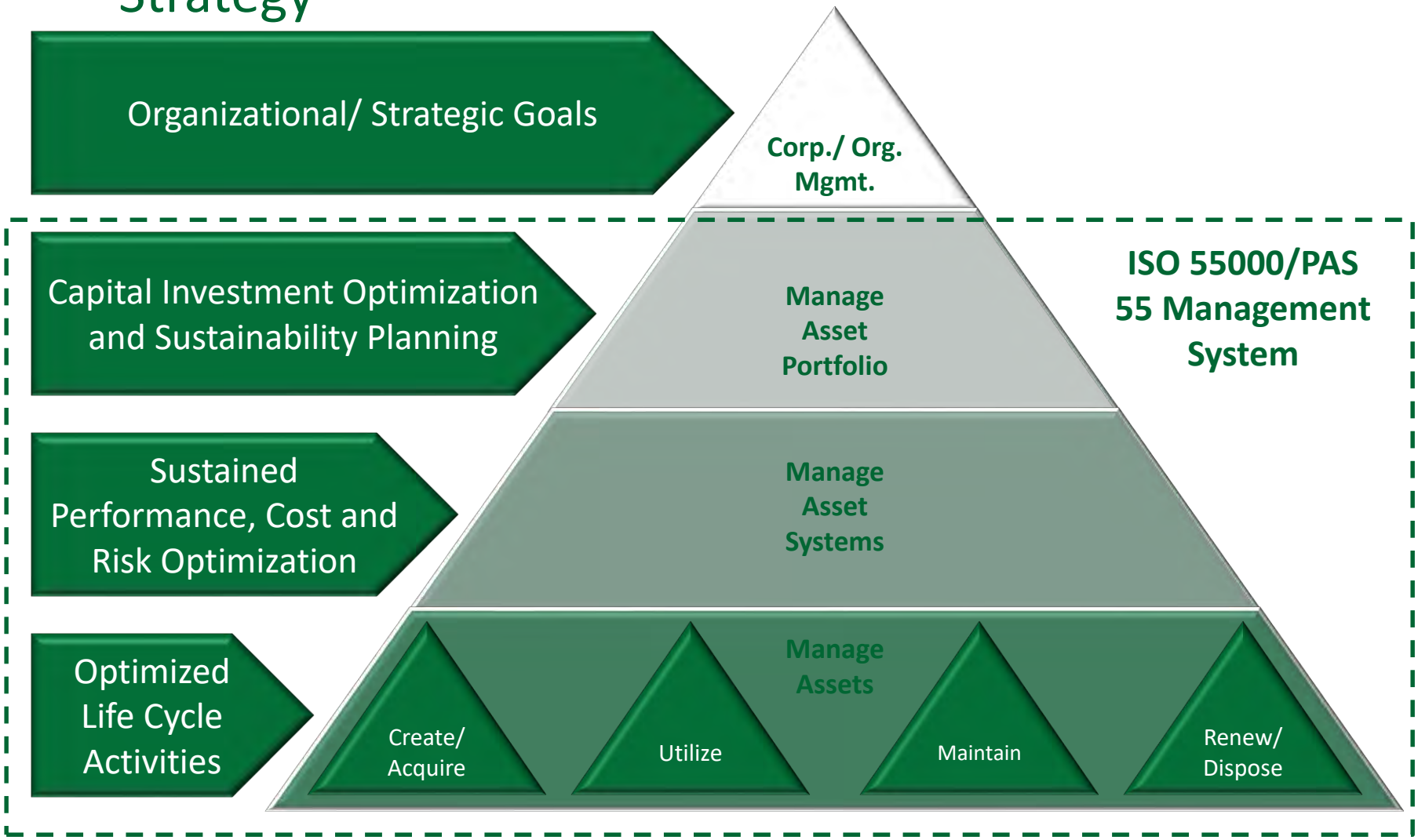
ISO 55000/Publicly Available Specification (PAS) 55 Strategy



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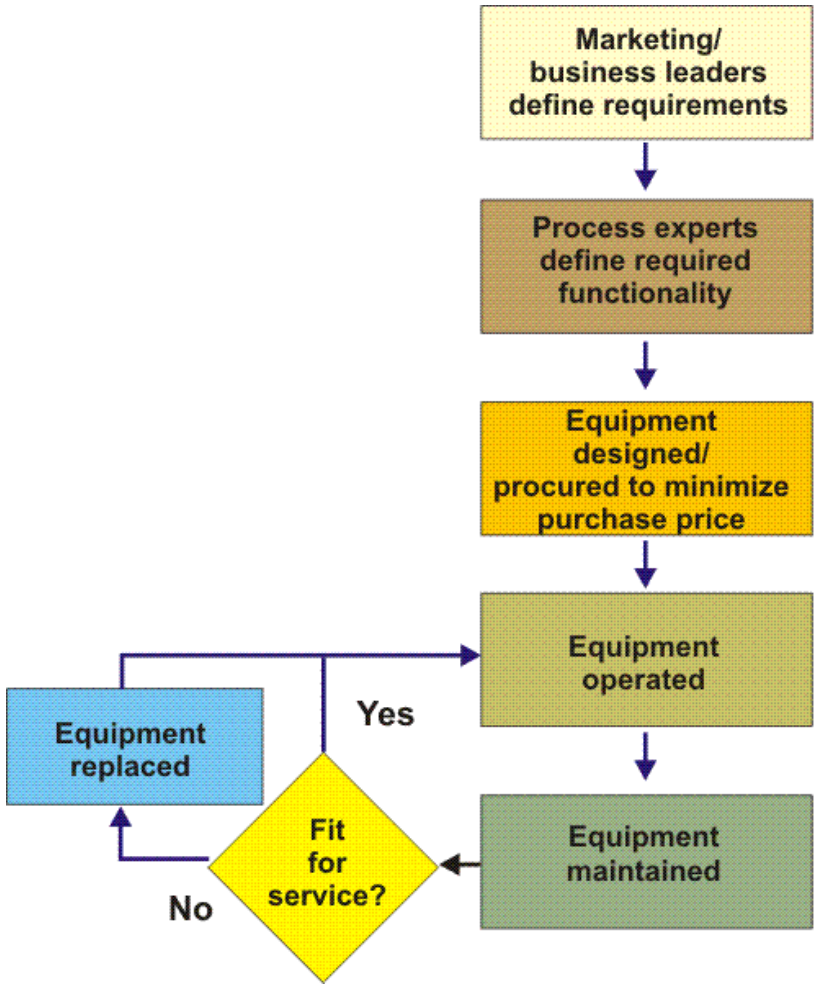
Design and Procure – As Found



Traditional Design Model

- Primary focus is on achieving functional process capability
- Maintainability and operability are secondary considerations, if considered at all.
- Rewards are purchase price minimization driven
- Lack of feedback from the field results in repurchase of problem again and again

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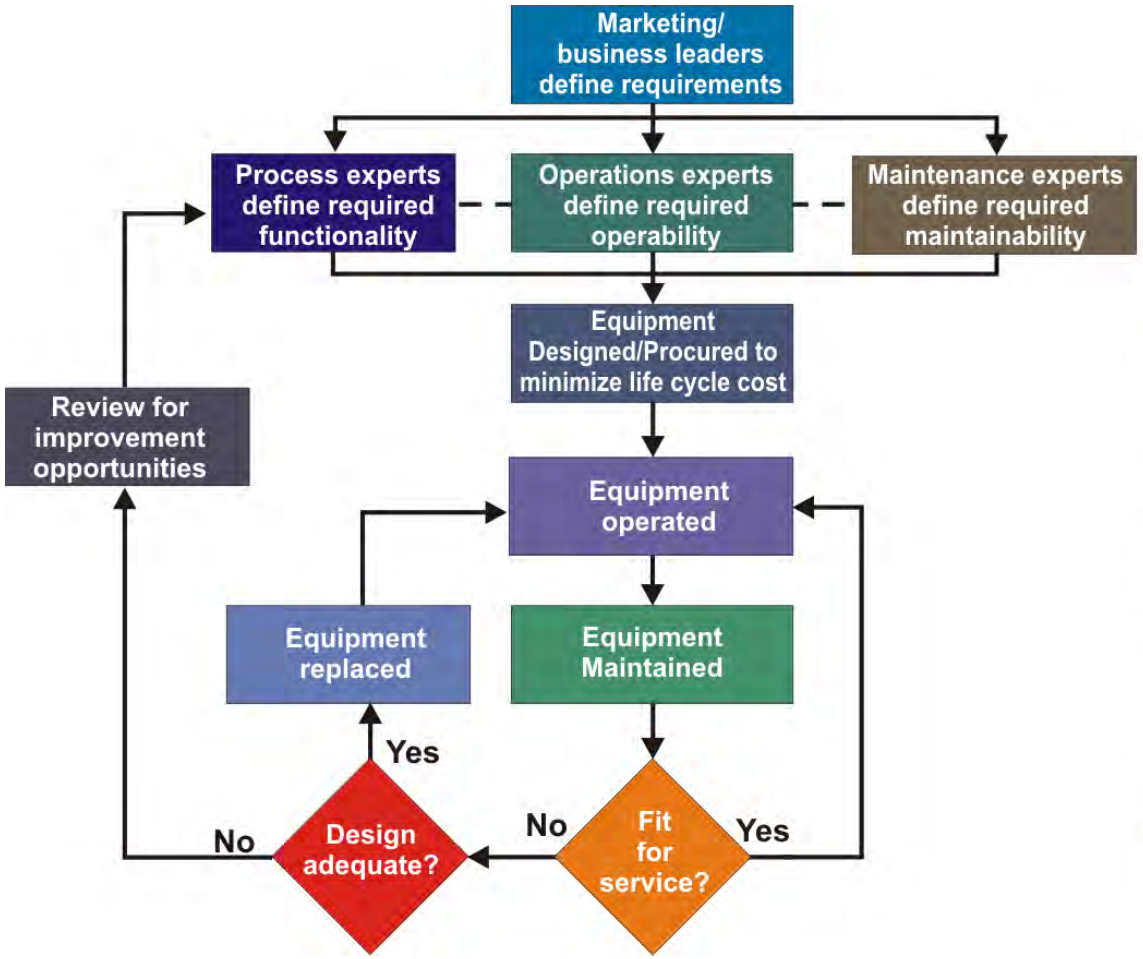
Ref: DT

Design and Procure – As Desired



Reliability-centered Design Model

- Process, operations and maintenance experts are involved in the design
- Maintainability and operability are primary focus areas
- Objectives and rewards are life cycle cost minimization driven
- Constant feedback avoids repurchase of problems

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Operations in the Reliability Equation

Standard Operations	Operator Involved Reliability	Operator Involved Maintenance
Startup	Inspections	Cleaning
Operation	Identify Work	Lubrication
Changeover	Setting Priorities	Basic Repairs
Adjustment	Planning/Scheduling Meetings	*Reserves maintenance resources for complex work.*
Effective Production Scheduling	Backlog Review	
Shutdown	Failure Analysis	

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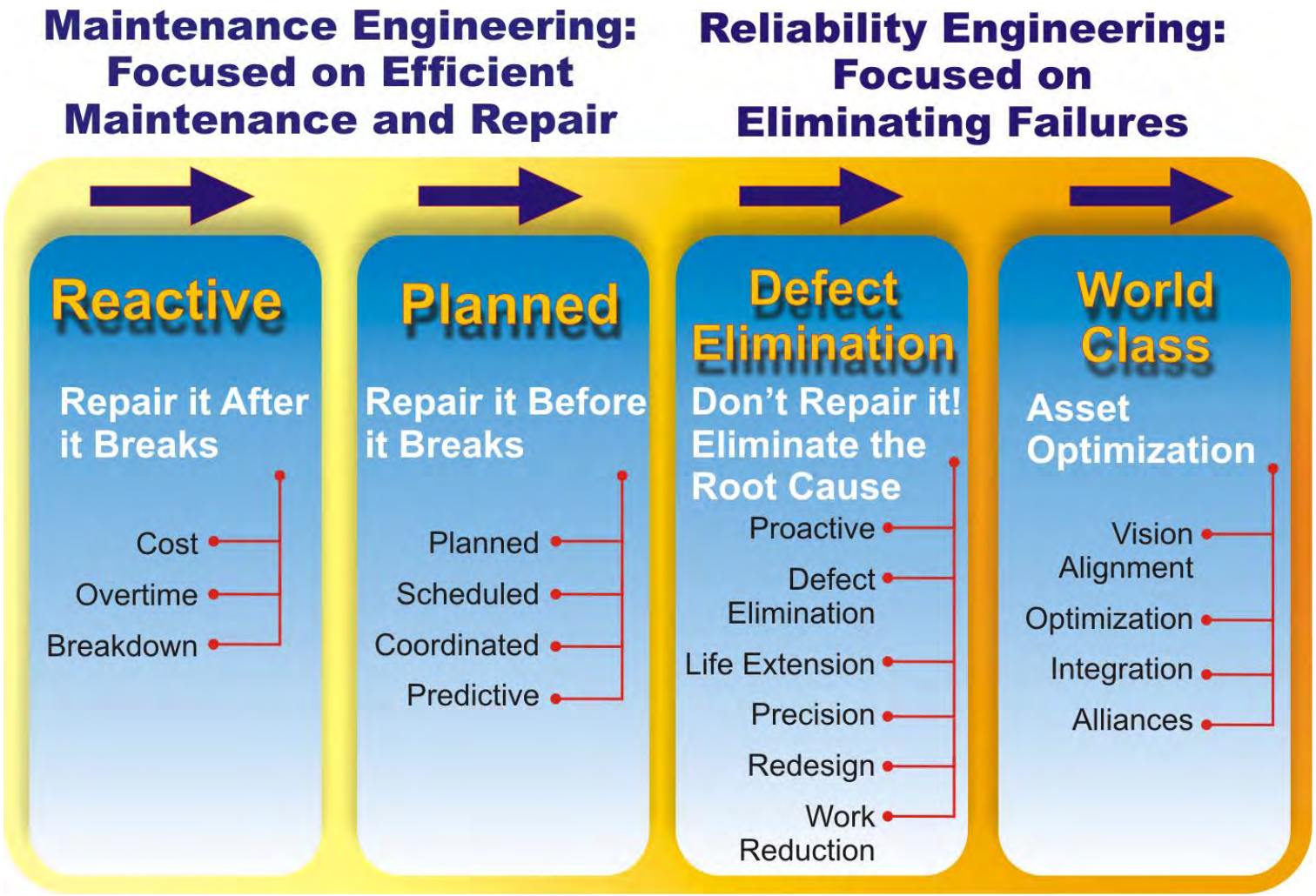
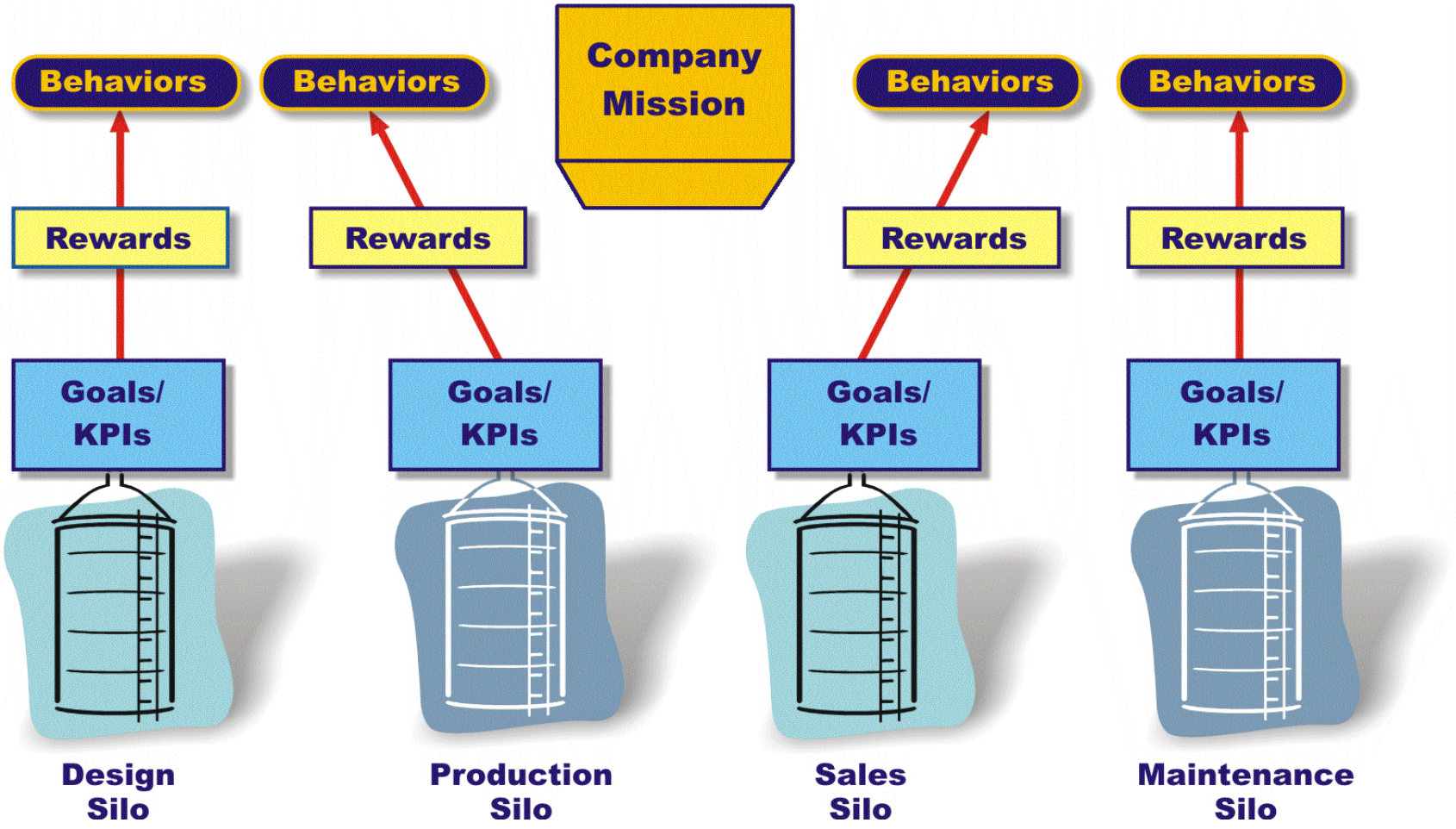
Ref: HSBRT, DT

The Journey to World-class Maintenance



Ref: DuPont, GT

Are Your Behaviors Aligned With the Mission or Lost in a Silo?



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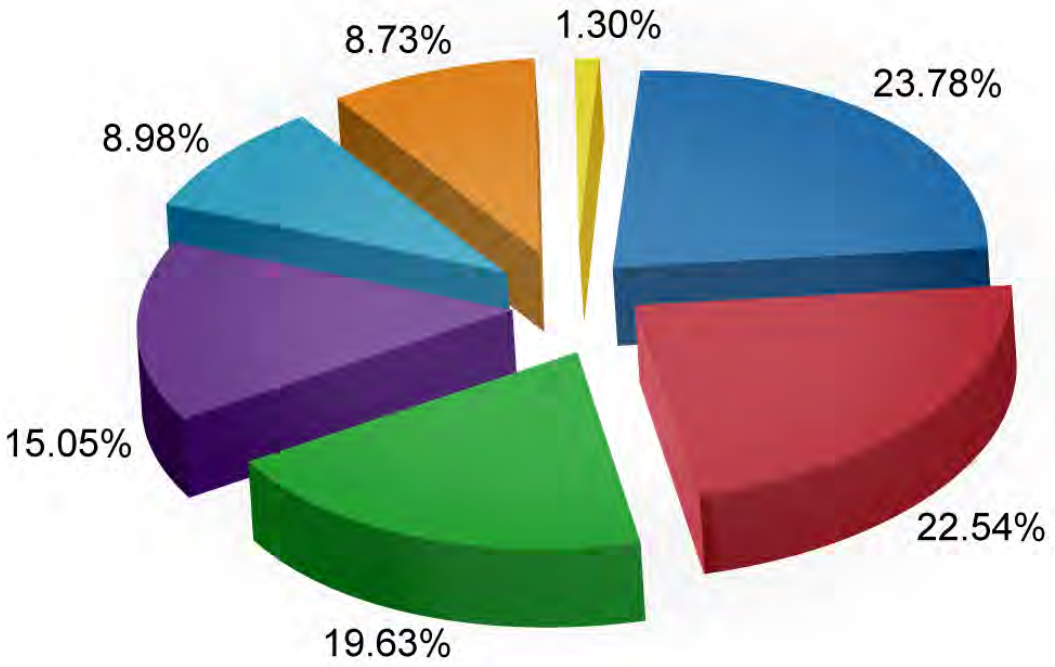
My Own Research About What Goes Wrong in the Plant



DOE NE 1004 Criteria:

- Procedural Problem
- Personnel/Human Error
- Equipment/Material Problem
- Training Deficiency
- Management Oversight
- Design Problem
- External Phenomenon

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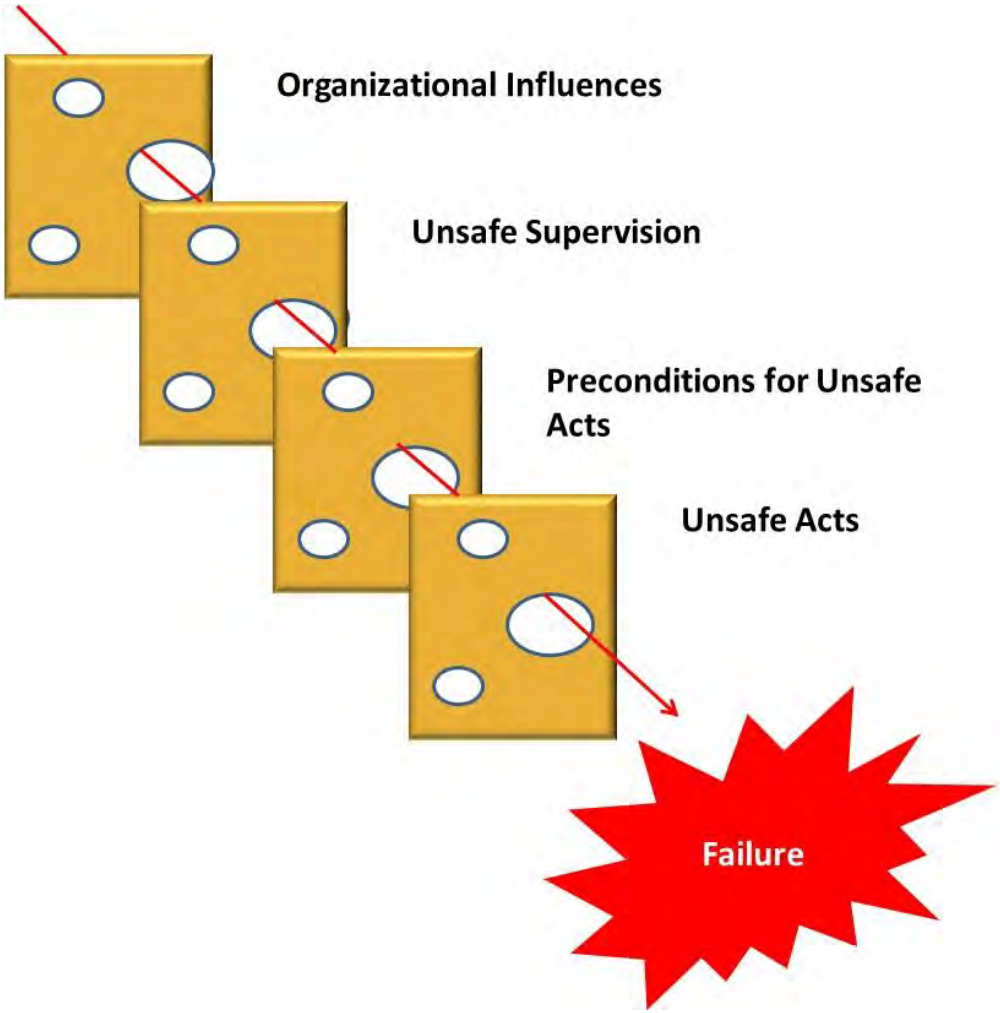
Reasons' "Swiss Cheese" Model



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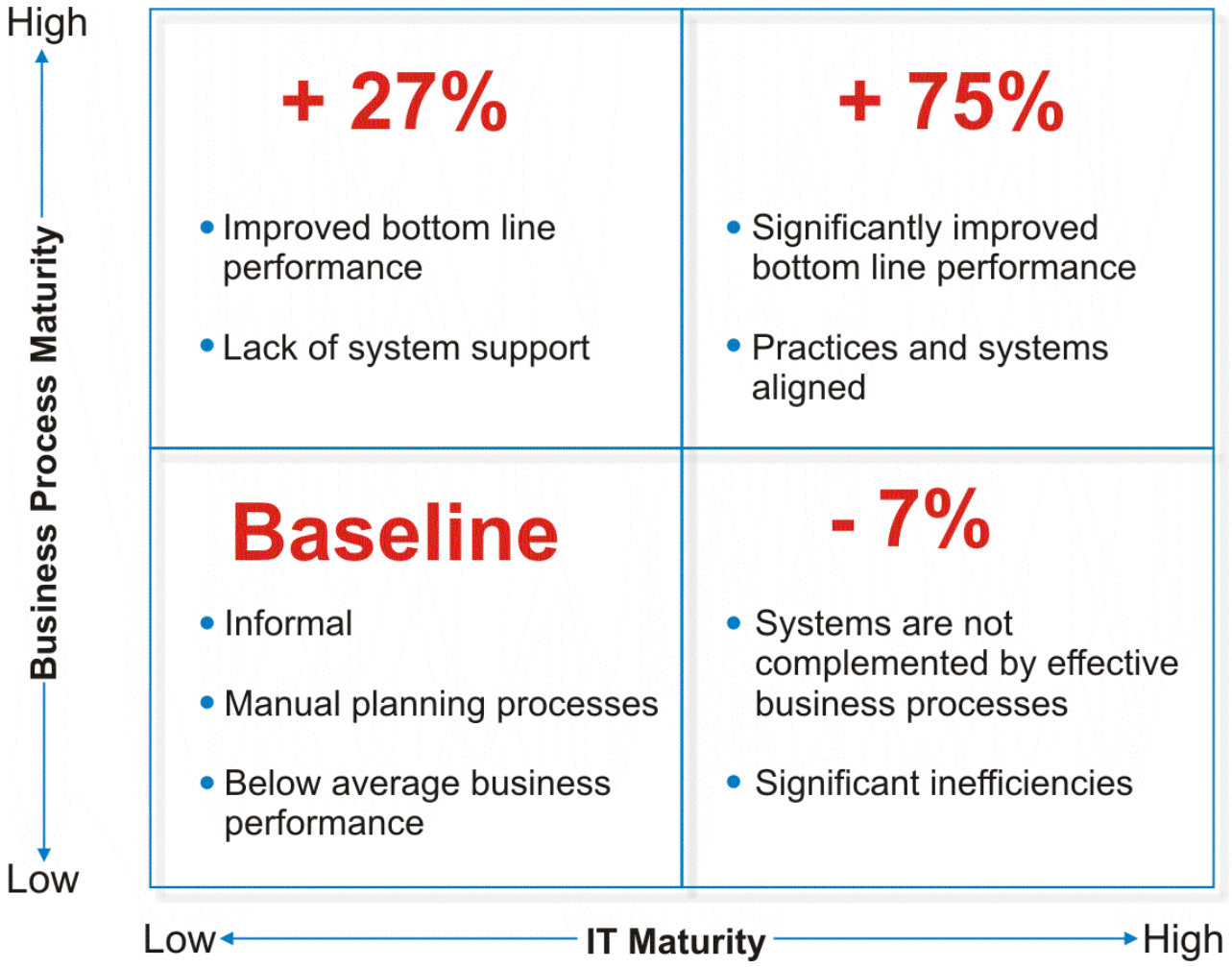
You Can't Just Buy Reliability…
You Must Reengineer - Supply Chain Management Example



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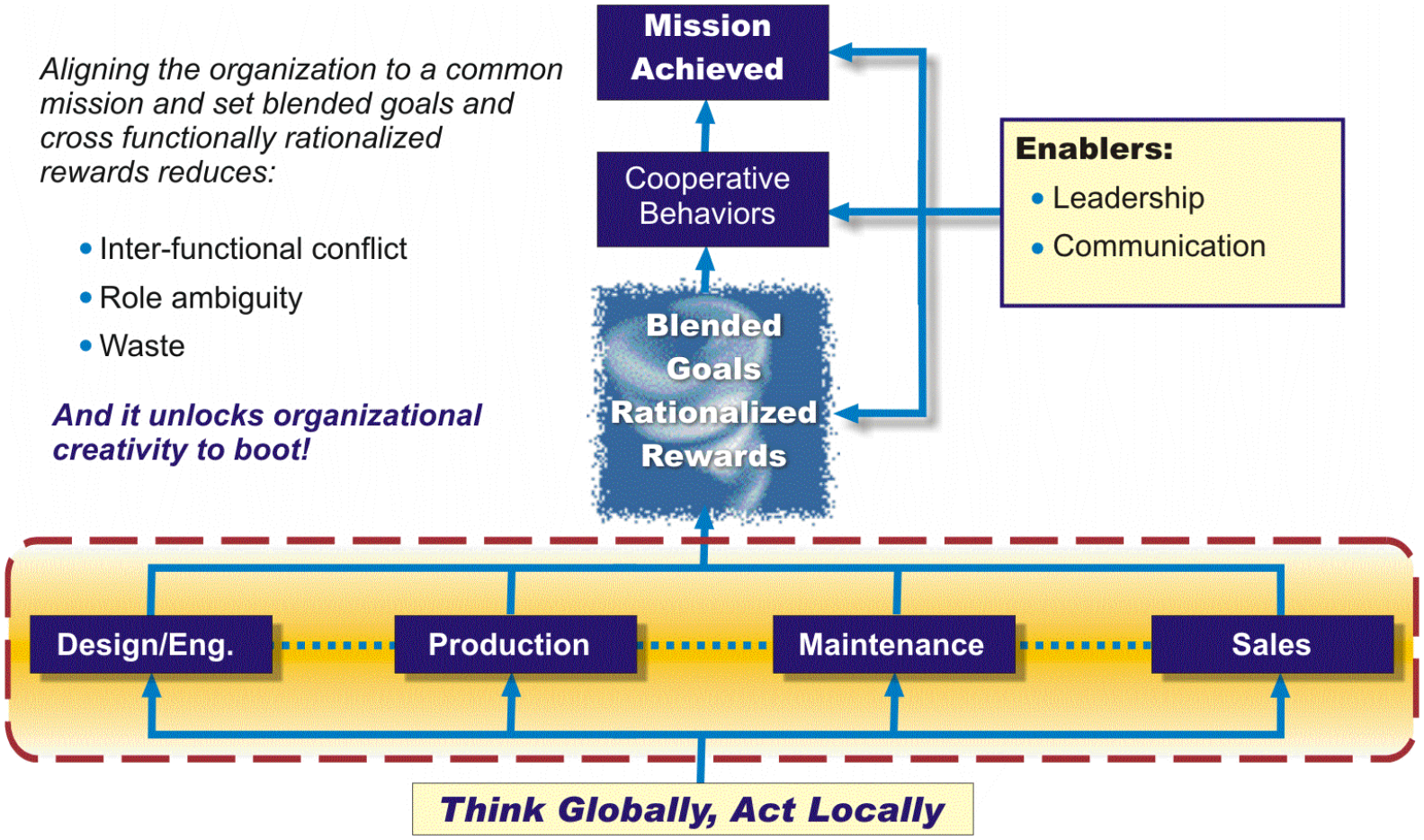
Ref: Brynjolfsson (MIT), Wireman, DT

Break Down the Silos! Think Globally While Acting Locally

Aligning the organization to a common mission and set blended goals and cross functionally rationalized rewards reduces:

- Inter-functional conflict
- Role ambiguity
- Waste

And it unlocks organizational creativity to boot!



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Leading Metrics Drive Behaviors

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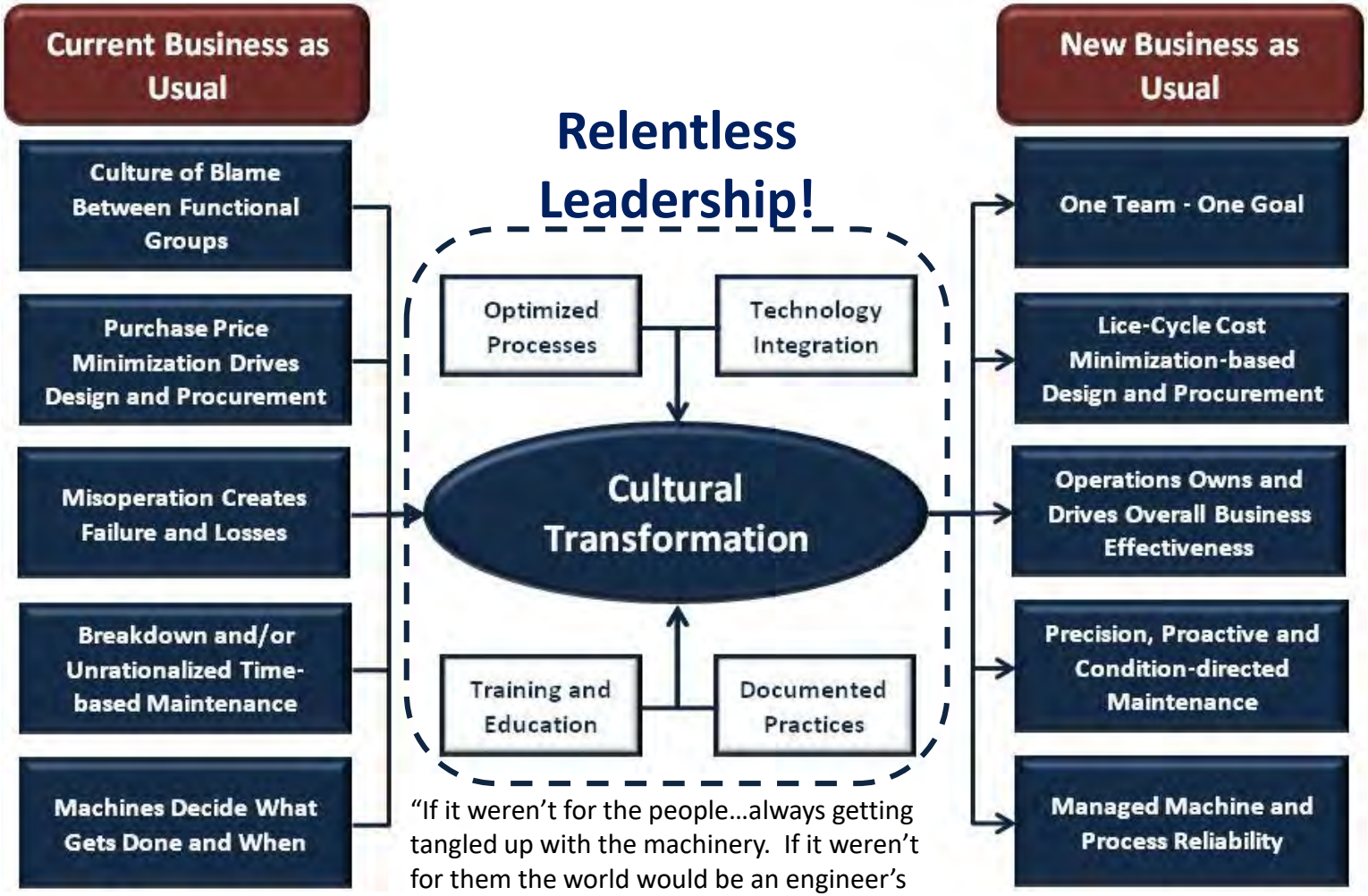
Creating a New Business as Usual



"If it weren't for the people…always getting tangled up with the machinery. If it weren't for them the world would be an engineer's paradise."

Kurt Vonnegut

Ref: DT

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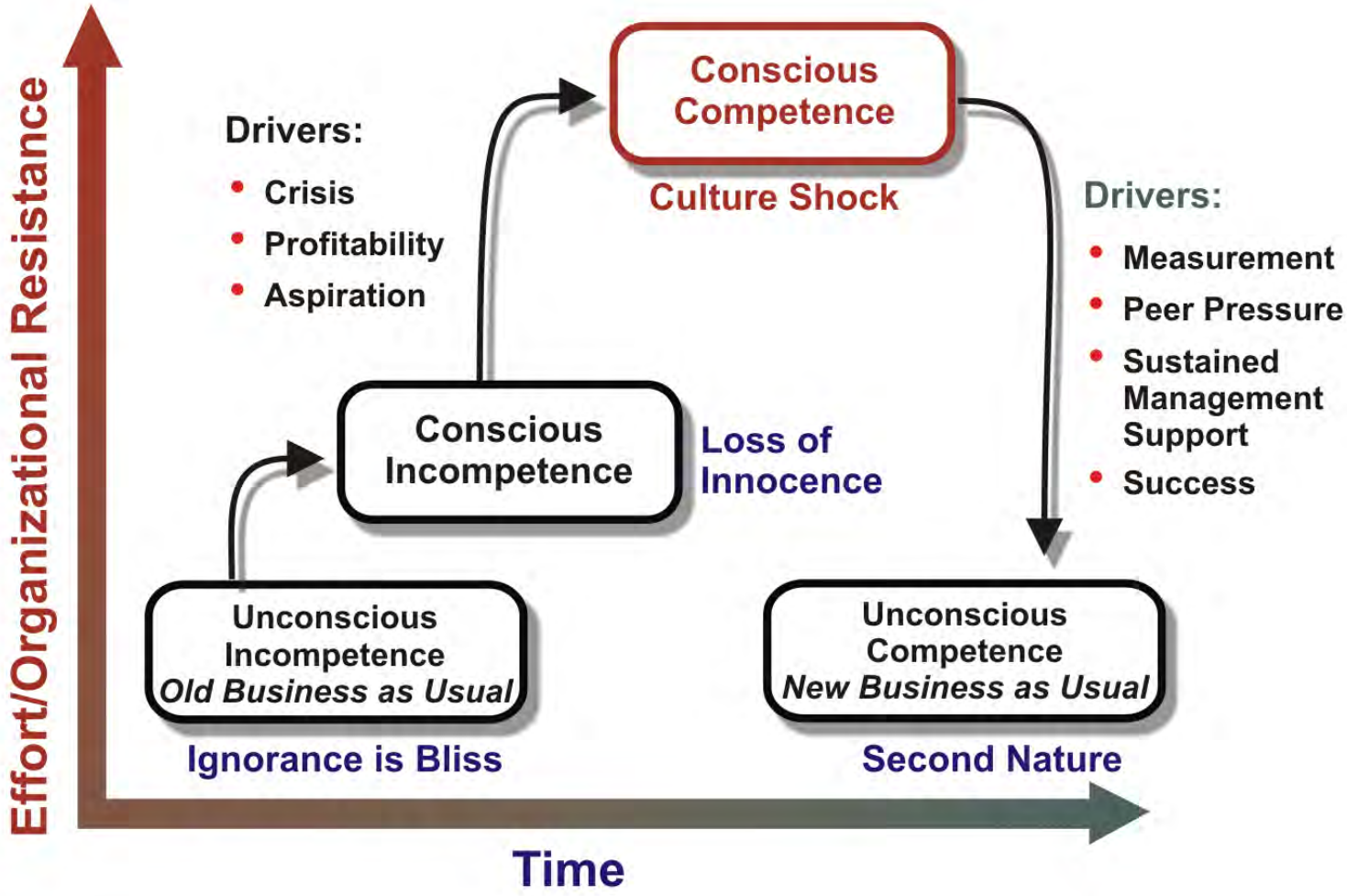
Time and Effort to Create a New "Business as Usual"



Ref: Collision and Parcell, DT

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Conclusions

- There are measurable differences between upper and lower quartile equipment asset managers
- These differences translate into better P&L performance and a leaner balance sheet – both drive RONA
- When used as a competitive advantage, upper quartile performers can opportunistically manage down markets, while their competitors scramble and react.
- Upper quartile performers employee precision asset management practices.
- Leveraging equipment asset management as a competitive advantage requires a top to bottom organizational culture change.

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Thank You!

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