Lean Enterprise Alignment
Module 12.1

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Presentation for:
ESD.60 – Lean/Six Sigma Systems
MIT Leaders for Manufacturing Program (LFM)
Summer 2004

These materials were developed as part of MIT's ESD.60 course on "Lean/Six Sigma Systems." In some cases, the materials were produced by the lead instructor, Joel Cutcher-Gershenfeld, and in some cases by student teams working with LFM alumni/ae. Where the materials were developed by student teams, additional inputs from the faculty and from the technical instructor, Chris Musso, are reflected in some of the text or in an appendix

Jamie Flinchbaugh – one of the founders of the Lean Learning Center - lean consulting

Redefining "lean"

Definition:

"*Becoming 'lean' is a process of eliminating waste with the goal of creating value.*"

Note: This stands in contrast to definitions of lean that only focus on eliminating waste, which is too often interpreted as cost cutting – independent of its impact on value delivery

Source: Lean Enterprise Value: Insights from MIT's Lean Aerospace Initiative by Earll Murman, Thomas Allen, Kirkor Bozdogan, Joel Cutcher-Gershenfeld, Hugh McManus, Deborah Nightingale, Eric Rebentisch, Tom Shields, Fred Stahl, Myles Walton, Joyce Warmkessel, Stanley Weiss, Sheila Widnall, (Palgrave, 2002)

"Islands of Success" from *Lean Enterprise Value: Insights from MIT's Lean Aerospace Initiative*

C-130J production
- Throughput of extrusion shop from 12 days to 3 minutes

Automatic code generation
- 40% reduction in time
- 80% improvement in quality

Military electronic modules from commercial lines at TRW
- 73% cost reduction

F-16 Build-to-Print Center
- 75% cycle time reduction

777 floor beam
- 47% assembly time reduction

P & W General Machining Center
- 67% reduction in lead time

Delta IV launch vehicle
- 63% reduction in floor space

GE Lynn aircraft engine facility
- 100% on time deliveries

Joint Direct Attack Munition (JDAM)
- 63% reduction in unit cost

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Initial Evidence at the Enterprise Level

- F-16 maintained sales price and decreased order-to-delivery time by up to 42% while production rate decreased 75%
- C-17 unit priced decreased from $260M to $178 M for final 80 aircraft of 120 aircraft buy.
- Northrop Grumman ISS lean enterprise implementation reduced throughput times for major systems by 21 to 42%.
- F/A18-E/F EMD completed on time, within budget (without rebaseline) while meeting or exceeding performance requirements.
- Raytheon realized $300M FY 2000 bottom line benefits from its enterprise wide Six Sigma program

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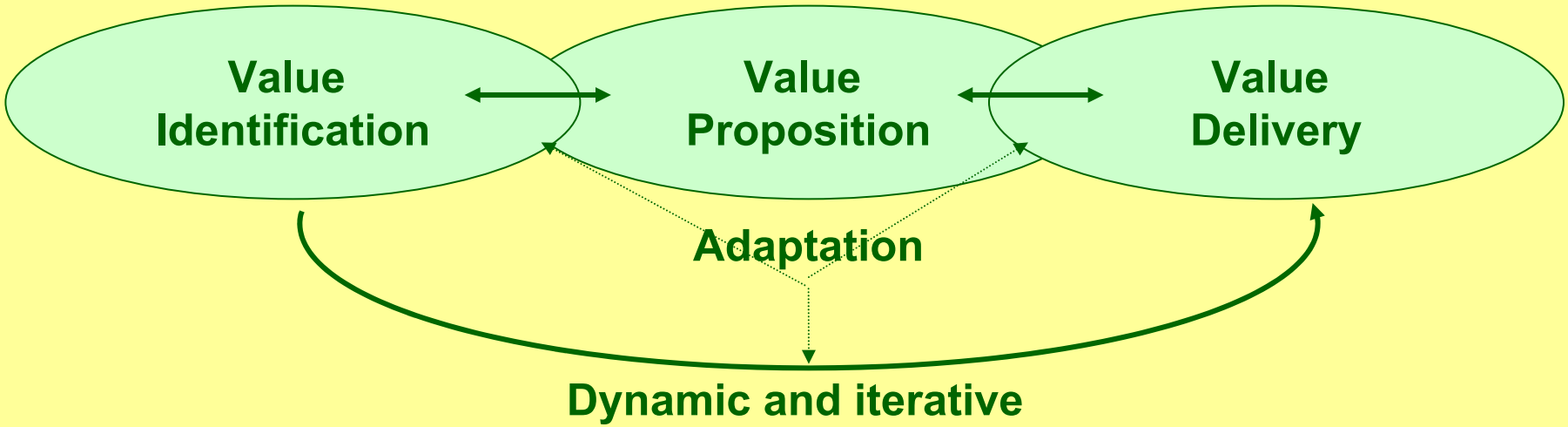
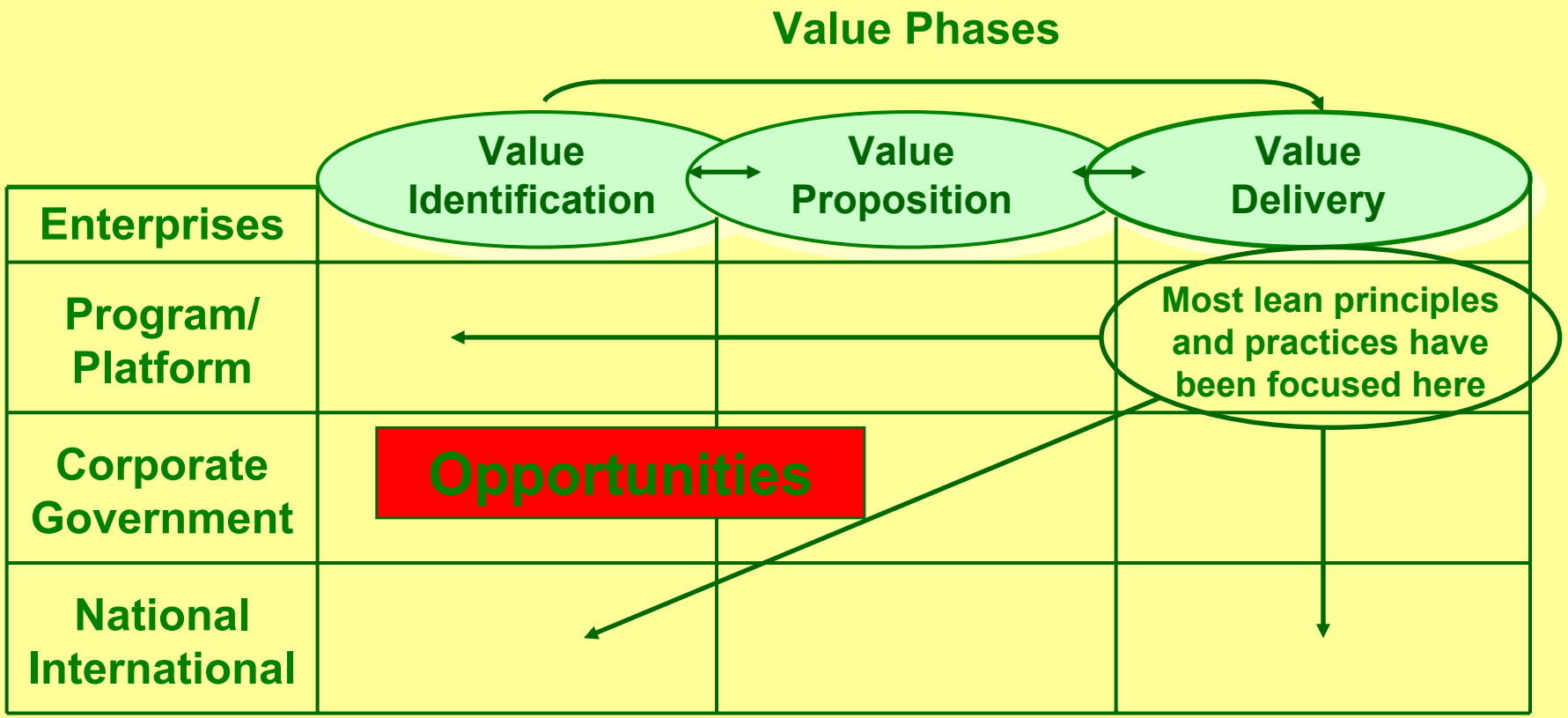
Value Creation and Value Streams

Value Creation Process



Program/Product Value Stream

Value Creation and Levels of Enterprise



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Additional Detail on Lean Enterprise Value

Again, the focus of most lean initiatives

Enterprise Levels	I. Value Identification	II. Value Proposition	III. Value Delivery
Program Enterprise	**Aim:** Identify value-add opportunities for customer and end users; Assess implications for other key program stakeholders	**Aim:** Construct a mutual gains agreement on value to be delivered among program acquirer, contractor, suppliers and others; Align incentives to focus on stakeholder value	**Aim:** Implement lean principles and practices across the value stream — including product development, manufacture and sustainment (termed 'Lifecycle Processes' in Figure 6.50)
Multi-program Enterprise	**Aim:** Identify value-add synergies across programs; Assess implications for internal and external stakeholders — including strategic partners, the financial community, and others	**Aim:** Construct mutual gains agreements to develop current and future capabilities across the enterprise; Align enterprise incentives to prevent sub-optimization across programs	**Aim:** Align enterprise support systems to enable lean implementation across multiple value streams — including information systems, financial systems, human resource systems, and others
National Entreprise	**Aim:** Identifying incremental and breakthrough opportunities to advance the four core missions for the national aerospace enterprise	**Aim:** Establish overall system incentives to simultaneously ensure stability and foster innovation for the national enterprise	**Aim:** Establish flexible, robust institutional infrastructure oriented around ensuring current and future capability

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Key Principles

Principle 1

- **Create lean value by doing the job right *and* by doing the right job.**

Principle 2

- **Deliver value only after identifying stakeholder value and constructing robust value propositions.**

Principle 3

- **Fully realize lean value only by adopting an enterprise perspective.**

Principle 4

- **Address the interdependencies across enterprise levels to increase lean value.**

Principle 5

- **People, not just processes, effectuate lean value.**

Note: These are very simple statements – think of them as first principles – use these as a constant "touch stone" guiding implementation specifics

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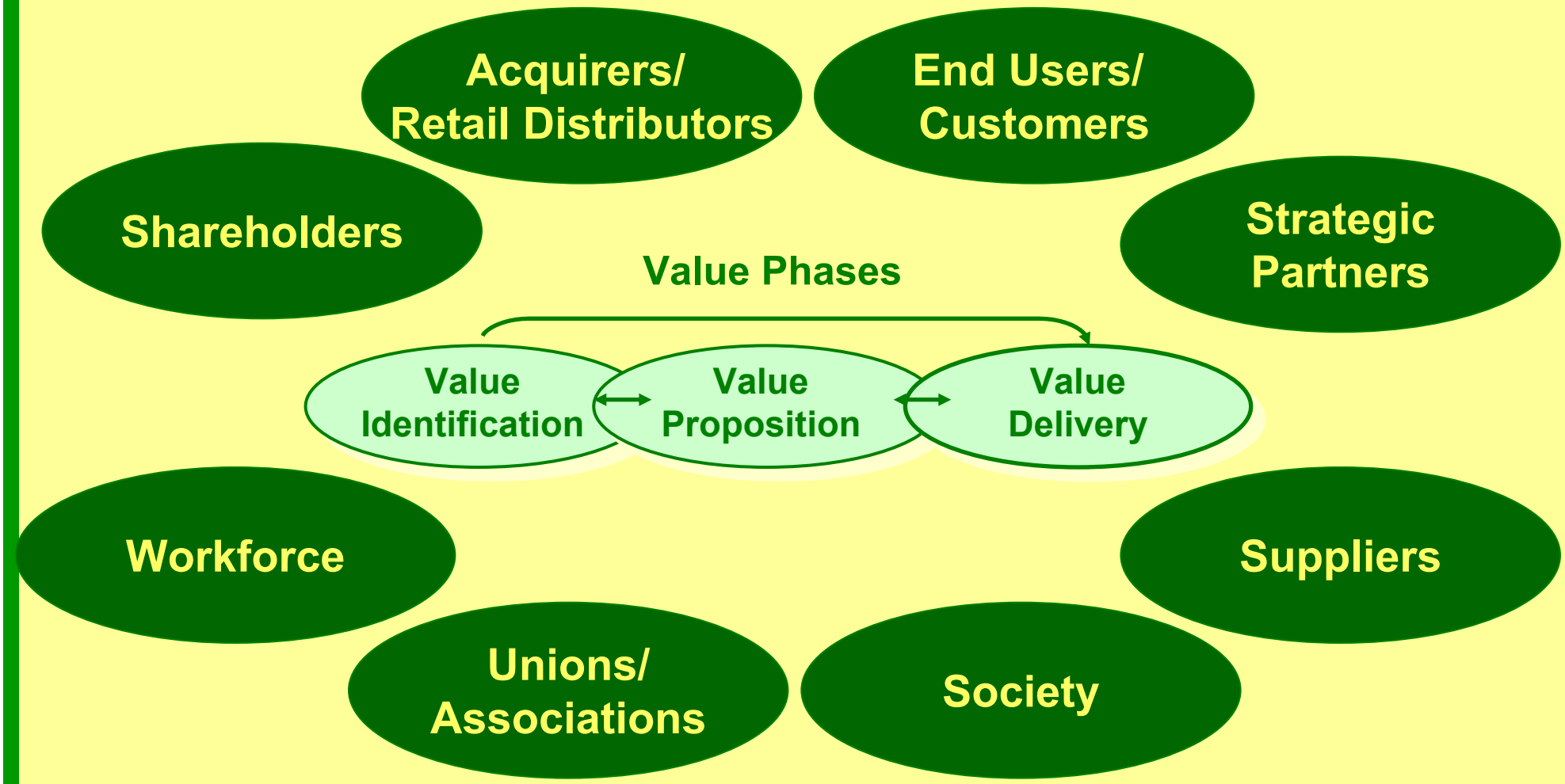
Enterprise Stakeholders



Note: "Customer Acquirers" in Aerospace would be comparable to "Dealers" in the Auto Industry

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Enterprise Example: JSF Program

Centralized Control

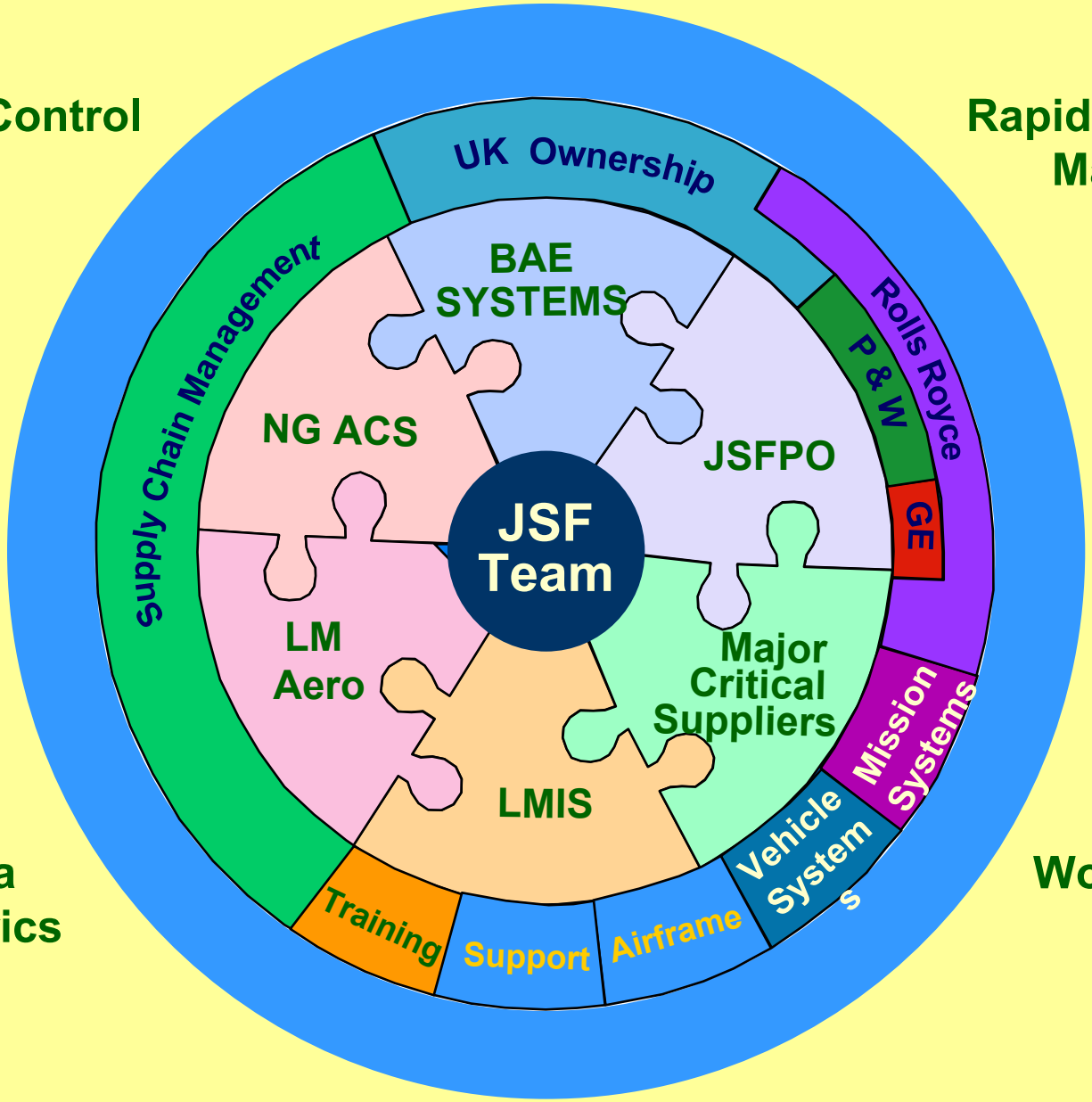
Rapid Decision Making

Decentralized Execution

Flexible Repositioning

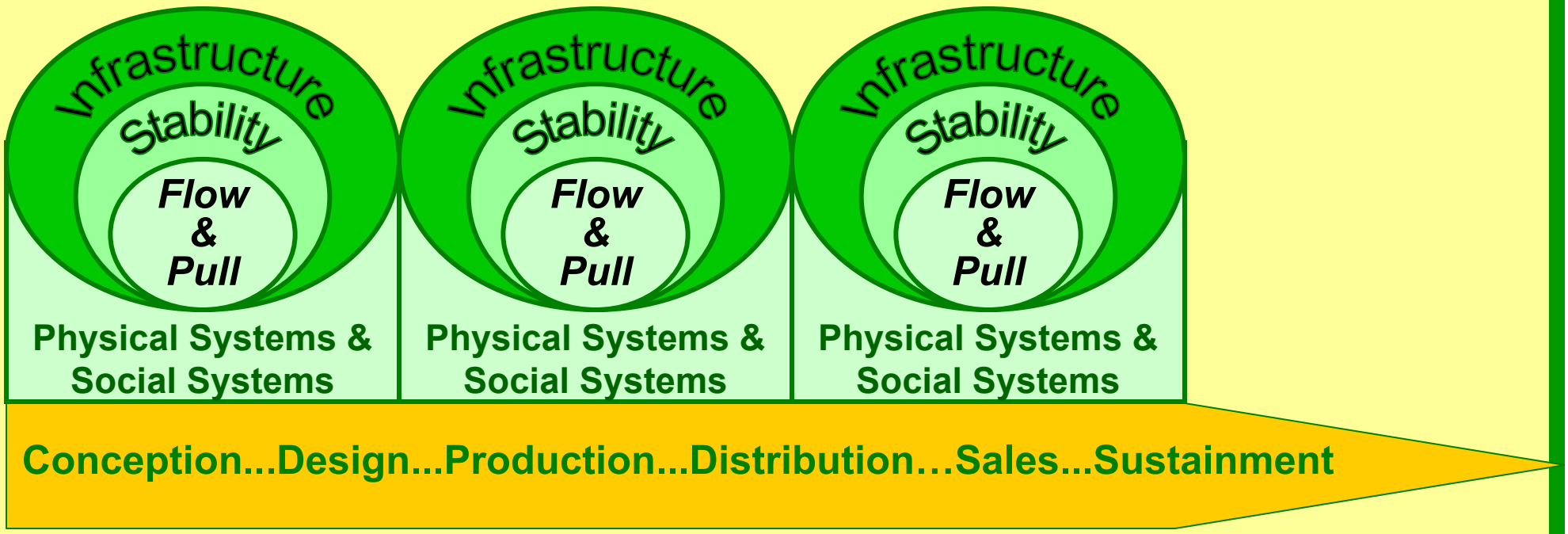
Status at a Glance Metrics

World Class Team

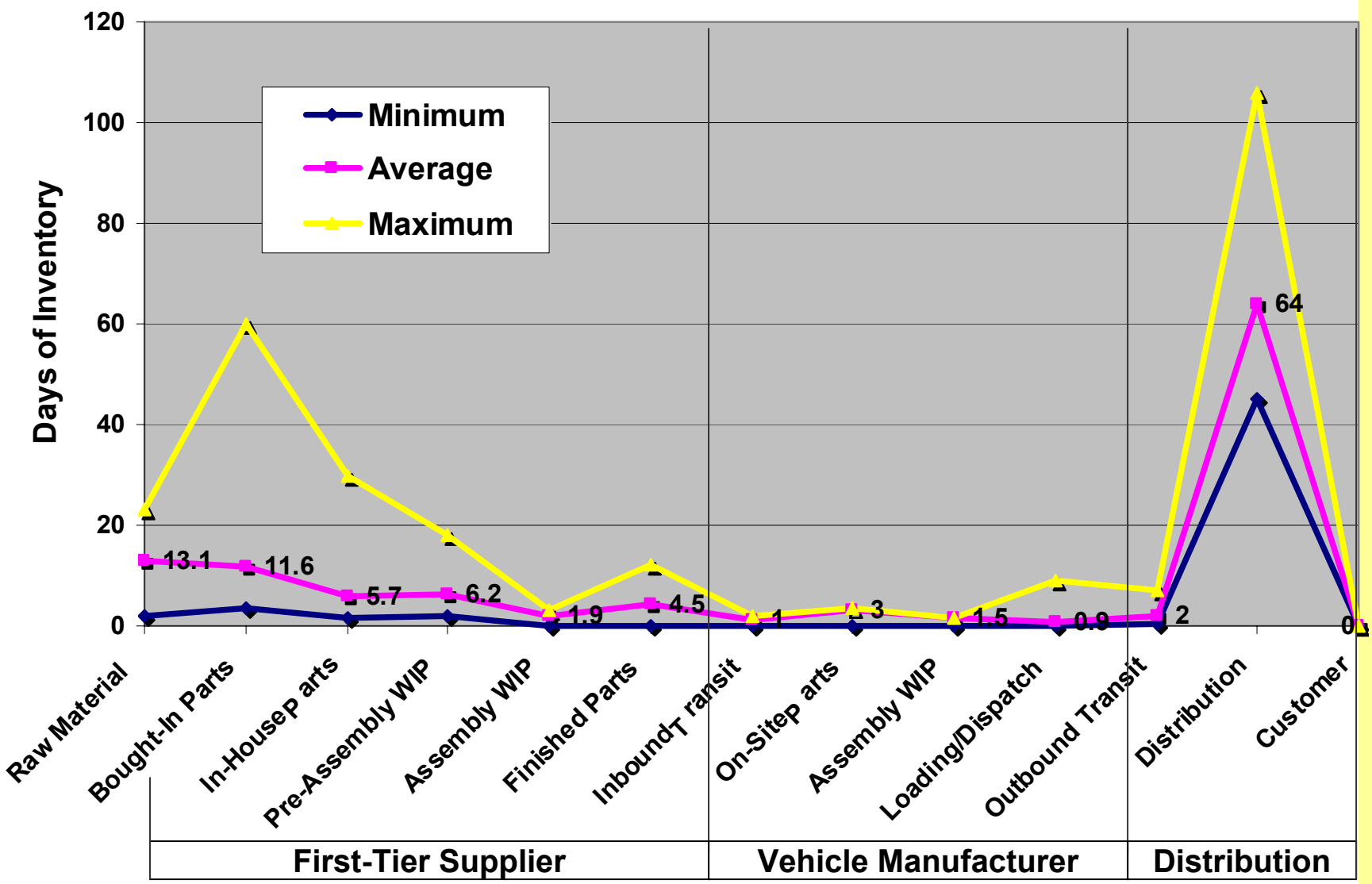


Source: Tom Burbage, Lockheed Martin Aeronautics

Applying Course Principles Across the Enterprise



Inventory Profile Across UK Auto Supply Chain (average, min and max stock levels across six manufacturers)



(Source: Matthais Holweg and Frits Pil, "The Second Century: Reconnecting Customer and Value Chain through Build-to-Order," MIT Press, 2004)

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Remember Dr. Deming's Lesson:
"*Don't blame the people, fix the system*"