

Lean Enterprise Institute



# Lean Product and Process Development

*a free webinar  
presented by the*

**Lean Enterprise Institute**



# Webinar “Housekeeping” Tips

## Disable pop-up blockers

## Adjusting your volume:

- Use the slide at the top right of the console
- Adjust within Windows Media Player or RealPlayer
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## Viewing slides

- Enlarge

# Webinar “Housekeeping” Tips

## Asking questions

- Use the “question” box in the lower right corner
- Submit questions as they occur to you by typing in the box, then click submit
- Questions will be answered during the Q&A session at the end of the presentation.

# Question and Answer

We will do our best to answer as many questions as possible in the allotted time.

Answers to the questions that we cannot get to during the webinar will be answered on our website soon.

We will notify you when they are available.

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# Today's Speaker



Durward Sobek  
Associate Professor and Graduate Program  
Coordinator of Industrial & Management  
Engineering  
Montana State University  
Bozeman, MT

Al Ward's Ph.D. student

Laid the basic research foundation

Co-formulated many of the initial ideas in the book,  
*Lean Product and Process Development*

# Introducing AI Ward

BA in History, U. of Oregon

Captain of the US Army

Ph.D. in Mechanical Engineering, MIT

Professor of Mechanical Engineering, U. of  
Michigan

Machine designer

Observer, thinker, philosopher, author

# Why publish now?

**His insights into the fundamentals of PD are powerful, and relevant.**

Today I'm going to share a few of those insights with you. I encourage you to get the book, and read it, as I'll only be able to give you a few snapshots. You'll not think about product development the same ever again!

# The Fundamentals

Purpose and aim of PD

Useful Knowledge

Set-Based Concurrent Engineering

Entrepreneurial System Designers

Teams of Responsible Experts

Cadence, Flow and Pull

# What does development produce?

Operational Value Streams

# Three Core Value Streams

RM → Saleable Good

Order → \$\$

Idea → Hardware

# Three Core Value Streams

Operational  
VS

RM



Saleable  
Good

Order



\$\$

Development  
VS

Idea



Hardware



# Allen Ward's Insight

Development value streams create  
Operational value streams!

# Allen Ward's Insight

Development value streams create  
Operational value streams!



**Product  
Features**

# Allen Ward's Insight

Development value streams create  
Operational value streams!



Customer

Product  
Features

# Allen Ward's Insight

Development value streams create  
Operational value streams!

Manufacturing

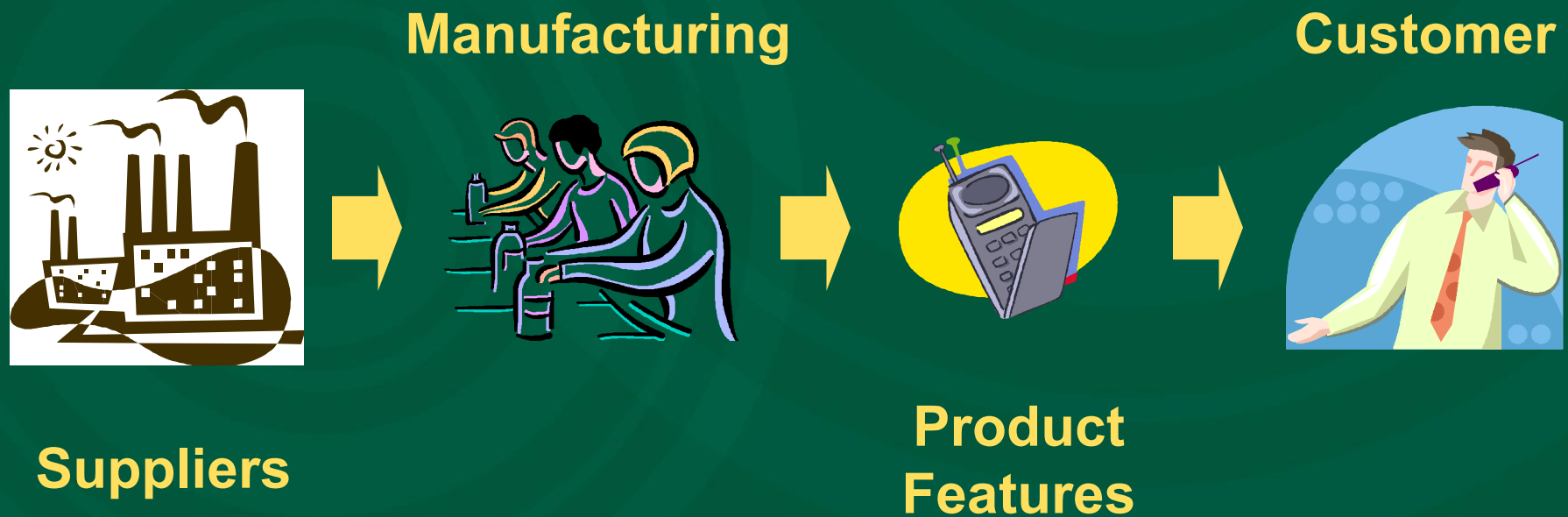


Customer

Product  
Features

# Allen Ward's Insight

Development value streams create  
Operational value streams!



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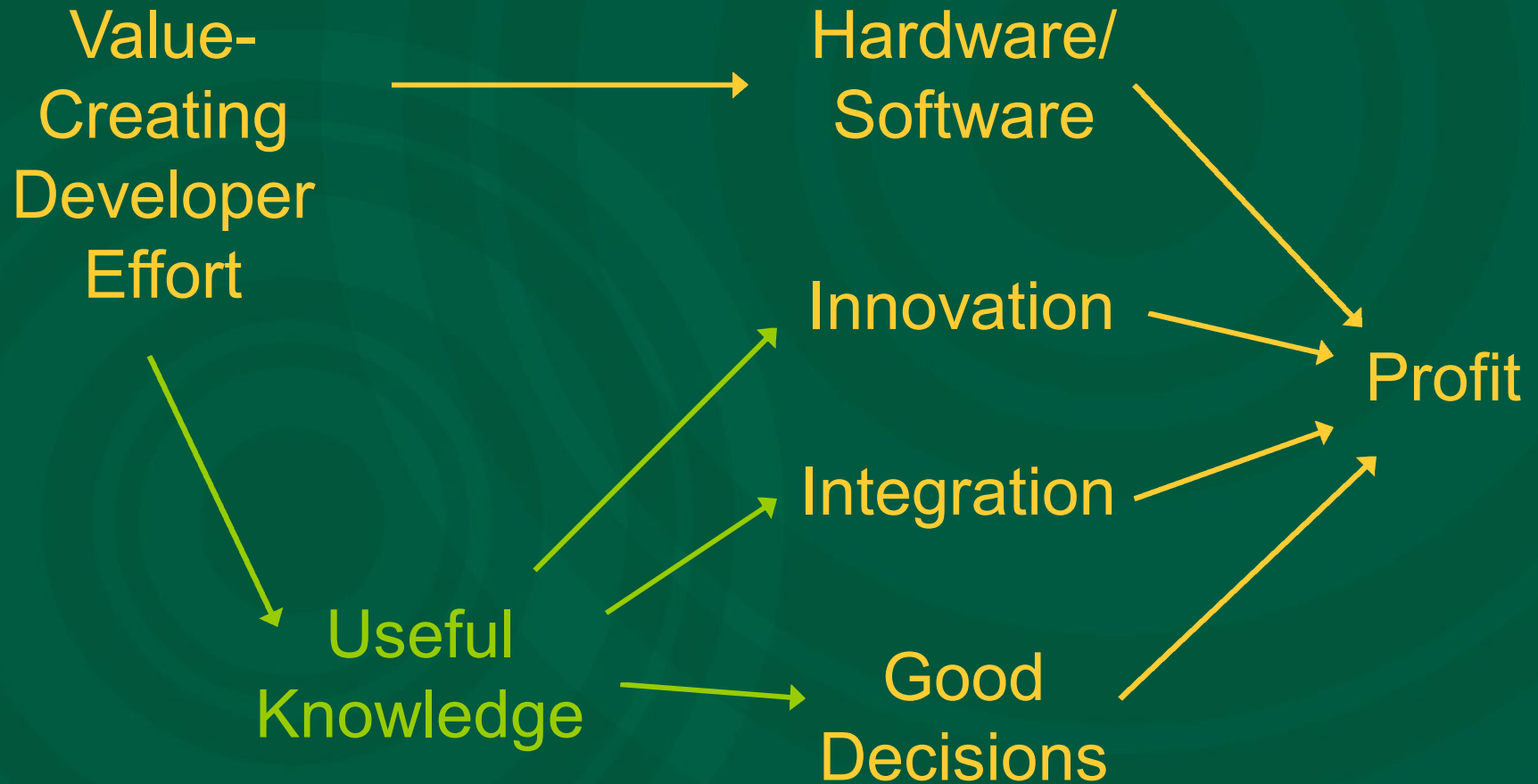
# What is a good development system?

One that consistently produces profitable value streams.

# From where do profits derive?



# From where do profits derive?



“Value added” in product development is creating **useable** knowledge and equipment.

# Generate Useful Knowledge

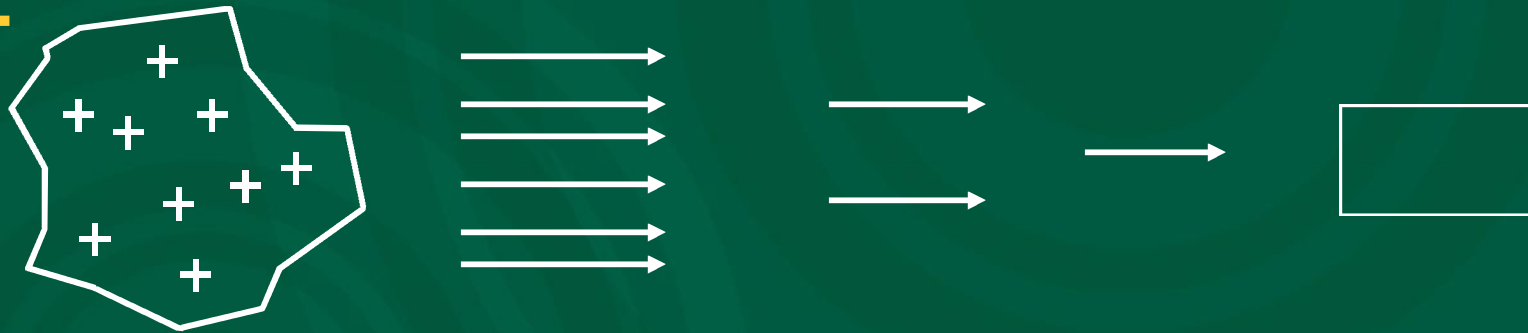
by exploring multiple solutions simultaneously;

by aggressively learning about the solutions, and eliminating weak ones;

by converging on a solution only after it has been proven.

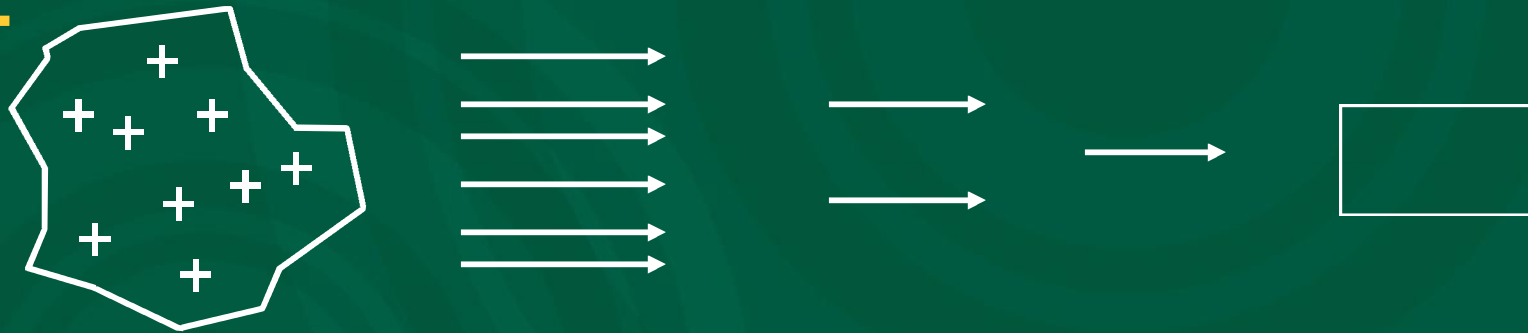
# Set-Based Concurrent Engineering

This:

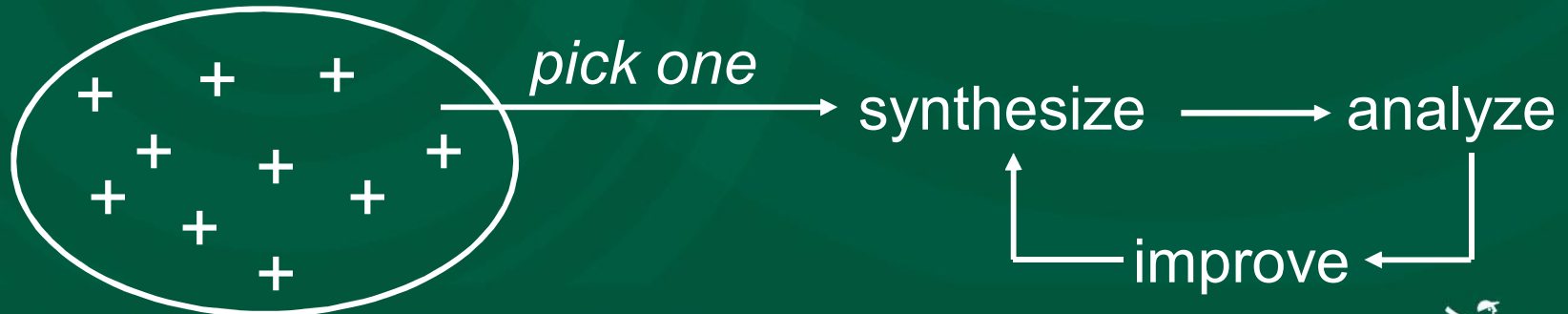


# Set-Based Concurrent Engineering

This:



Not this:



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# Trade-off Curves

by analyzing and testing to learn  
(not simply to validate)

Useful

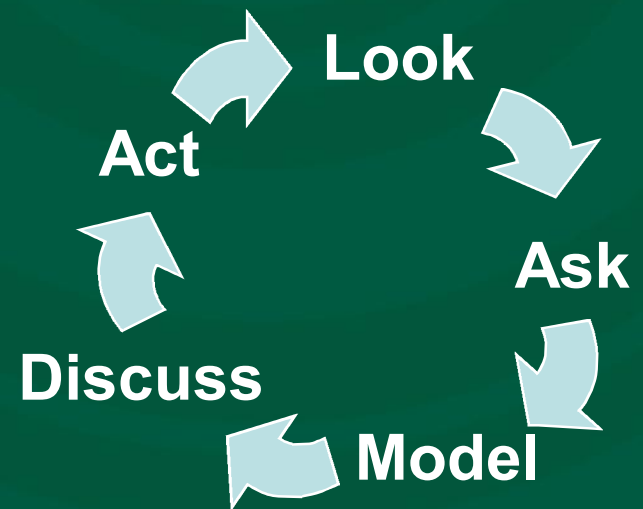
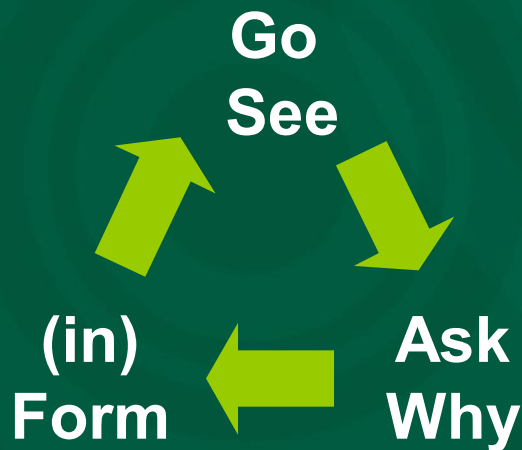


Not Useful

Test 1	P
Test 2	P
Test 3	F
...	

# Learning

by validating knowledge through  
the fundamental learning cycle



# Capture & Reuse the Knowledge

by synthesizing and documenting

Limit and trade-off curves

Succinct reports

Engineering standards / design guides

Reflection

**Is deep technological know-how  
enough?**

**NO!**

**It must be integrated.**

# A Story...

Sobek-san, what do you think of the new Taurus?

# A Story...

Sobek-san, what do you think of the new Taurus?

???

# A Story...

Sobek-san, what do you think of the new Taurus?

All the parts on the are best-in-class...

???

# A Story...

Sobek-san, what do you think of the new Taurus?

???

All the parts on the are best-in-class...

...but it is not a great car.



# How do you resolve:

Subsystem design  
convergence?

Design balance?

Subsystem interactions  
producing desired effects?

Conflicting  
customer desires?

# How do you resolve:

Subsystem design  
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Design balance?

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## Toyota's Remedy: The Chief Engineer



# The Chief Engineer

Leads vehicle development project...

Designs the system architecture...

Plans the development process... and runs it...

Drives consensus and tradeoffs...

Represents the customer...

Makes money.

**But most of the developers do not report to the Chief Engineer!**

**Who does the work?**

**Teams of responsible experts.**

# Teams of Responsible Experts

Create new knowledge around a subsystem...

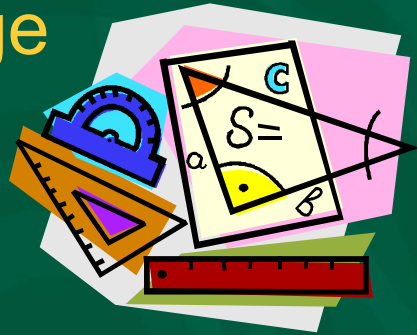
Communicate it...

Represent it to others, esp. the Chief Engineer...

Focus on overall project success...

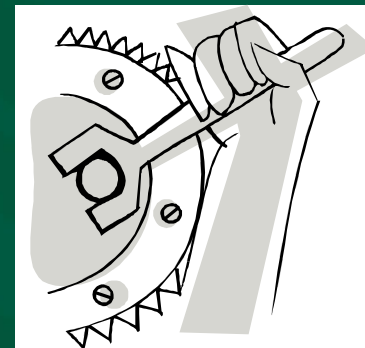
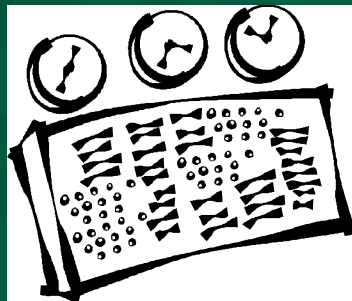
# Build expert teams by avoiding handoffs

Knowledge



Responsibility

Feedback



Action

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# Make Growing People a Priority

Q: What is your most important job as an engineering manager?

# Make Growing People a Priority

Q: What is your most important job as an engineering manager?

A: Helping my people become the best engineers they can be.



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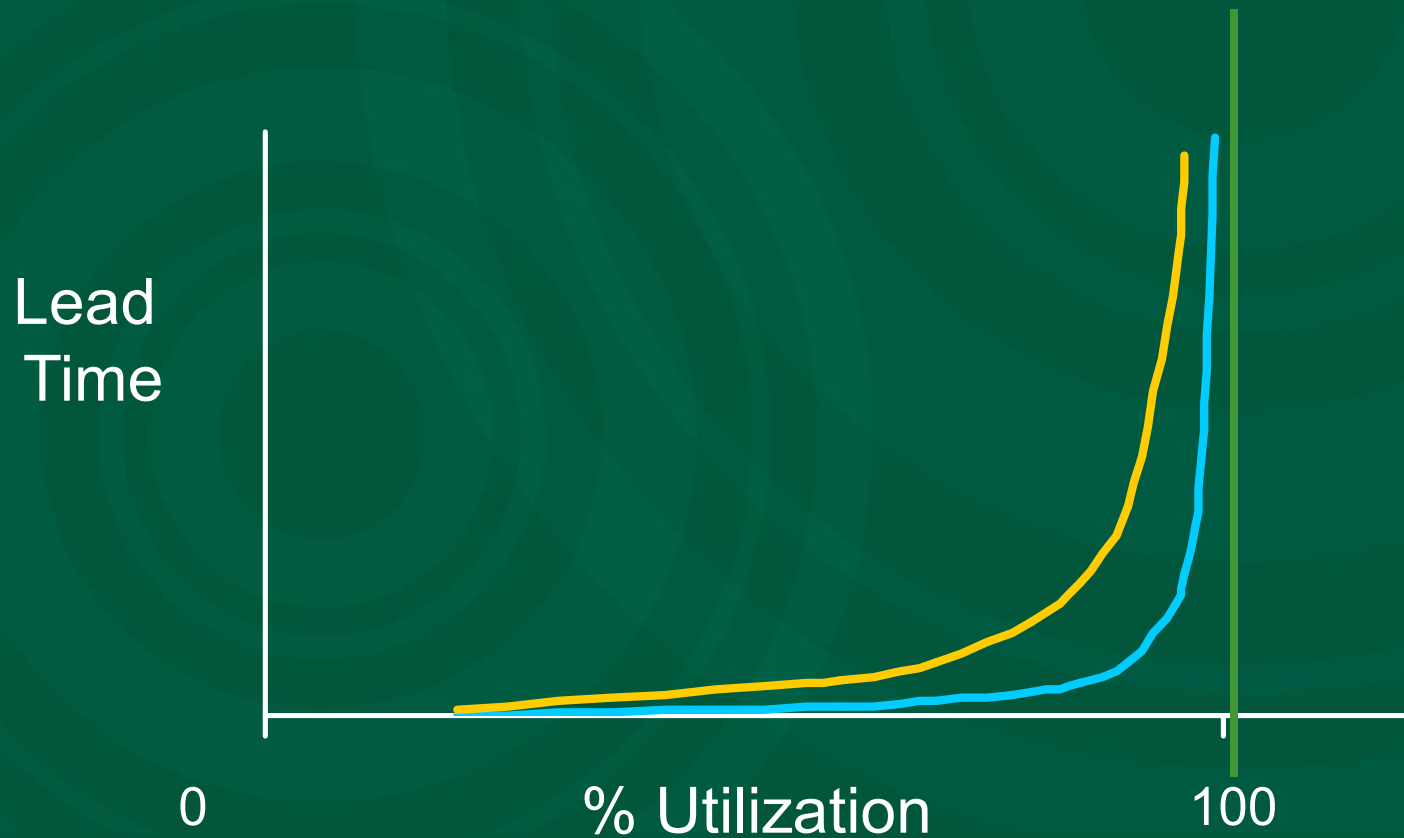
Technical Knowledge & Problem-Solving Skill

**“Lots of conflict  
makes great cars.”**

- Toyota Chief Engineer

# Manage the Flow

by eliminating *muri*



# Manage the Flow

by eliminating *muri*

HOW? Target events that “pull” developer effort

0 % Utilization 100



# Manage the Flow

by eliminating *mura*

Variability will be buffered by some combination of inventory, capacity and time.

- Hopp and Spearman,  
*Factory Physics*

# Manage the Flow

by eliminating *mura*

HOW? Cadence.

combination of inventory, capacity and time.

- Hopp and Spearman,  
*Factory Physics*

# Manage the Flow

by eliminating *muda*

Any activity that does not:

- directly result in hardware/software
- produce useable knowledge

should be **eliminated**,  
or redesigned so that it does.

# The Basics

The object of the game is to make profit, consistently.

The operational value stream generates the profit.

The rate and quality of output from development depend critically on knowledge.

# The Basics, cont.

Generate knowledge through set-based concurrent engineering.

Grow teams of experts who can use, generate useful knowledge.

Establish and support entrepreneurial system designers.

Eliminate overburden, instability, and waste through cadence, pull, and flow.

# AI's Hypothesis

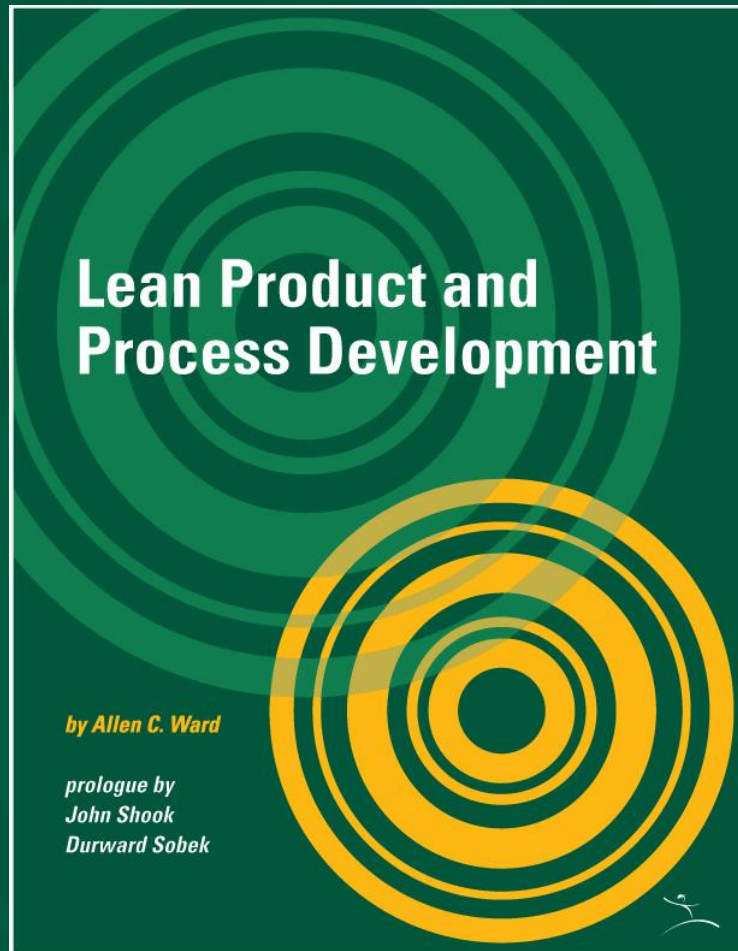
**Focusing on these fundamentals will greatly improve product development performance.**

**Will you help us test the hypothesis?**

"Perfection is not attainable. But if we chase perfection, we can catch excellence."

-Vince Lombardi

# Webinar Attendee Discount!



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# Question and Answer

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