Growing the Lean Community
An LAI Plenary Conference

Lean Product Development Definitions and Concepts
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Conceptually, value stream *thinking* is a key tool to understanding product development.

Can we use “classic” (*Lean Thinking, Leaning to See*) lean techniques in Product Development?

How?

“PD is a creative process - lean doesn’t apply”
“What is the value of staring out the window?”
“What is the value of a design option not chosen?”
Aspects of Lean Projects

➢ Concentrate here on the processes involved in design

➢ They are done repeatedly

➢ Often the “pacemaker” (bottleneck)

Phases of Product Development

From Ulrich & Eppinger, Product Design and Development
Most (Aerospace) PD is process

➢ “Invention is 1% inspiration and 99% perspiration” - TA Edison

➢ 40% of PD effort “pure waste”, 29% “necessary waste” (workshop opinion survey)

➢ 30% of PD charged time “setup and waiting” (aero and auto industry survey)

➢ “Product development is 1% inspiration, 30% perspiration, and 69% frustration” - HL McManus
➢ Value from the customer’s perspective
➢ Value Stream mapping and analysis
➢ Eliminate waste
➢ Flow and Pull
➢ Perfection and People

PD has some unique aspects in each case
Solutions (at least partial) known
Product Development serves the End User Indirectly—makes defining “Customer Value” non-trivial

Other stakeholders make demands on PD
Complexity of PD Value

Constraining Requirements
- Value-added actions (w.r.t. regulatory requirements)
  - Minimum required time spent ensuring that OSHA, EEO, and other regulatory requirements are met.

Product (Primary) Value Stream
- Value-added actions (w.r.t. the Product)
  - Contribution to product definition (form and function)
  - Contribution to manufacturing process definition.
  - Contribution to risk reduction
- Non Value-added actions (w.r.t. the Product)
  - Contribution to rework
  - Contribution to enhancement (is it a customer requirement?)
  - Contribution to efficiency
  - Contribution to technology

Human Resource (Secondary) Value Stream
- Value-added actions (w.r.t. the Employee)
  - Employee satisfaction
  - Employee training
  - Employee hiring
  - Employee benefits

Facilities/Equipment (Secondary) Value Stream
- Value-added actions (w.r.t. Facilities/Equipment)
  - Acquiring better equipment
  - Workplace organization

Financial Resources (Secondary) Value Stream
- Value-added actions (w.r.t. Financial Resources)
  - Generating financial statements for investors
  - Paying employees - Acquisition

Classic Lean says attack this and other benefits will follow

Be aware of, but not distracted by, other values
Defining Value in PD

- Slack (1998) - elements of Customer Value, needs of other stakeholders, and interactions
  - Complexities of global definition of value
- Chase et al. - local definition

PD processes contribute value via:

- Functional performance of end product
- Definition of processes to deliver product
- Form of final output (build-to-package...)
- Reduction of risks and uncertainties
➢ Womack: “the flows are invisible”
   ➢ They are flows of *information*, not material

➢ Complex, non-linear, and iterative flows
   ➢ Sometimes this is bad: simplify and straighten
   ➢ Others, necessary: facilitate

➢ Informal exchanges versus procedures

*Millard will speak on value stream mapping tools*
Lean tools for eliminating waste

➢ Office/technical processes
➢ Information flows
➢ *Reinterpret classic lean tools in this context*
  ➢ 7 Wastes
  ➢ 5 S
  ➢ Load Leveling
  ➢ Single-minute die exchange
Info-Wastes

➢ Reinterpret the seven wastes in an information context

➢ Dramatically different interpretations, consequences, and solutions, e.g.:

1 Over-production

➢ Easy and cheap/free to duplicate and distribute information, *but*

➢ Handling, sorting, filing unwanted information is a waste (think about your email inbox…)

1 Over-production
   ➢ Handling of duplicated information
   ➢ Creation of unnecessary data and information
   ➢ Information over-dissemination
   ➢ Pushing, not pulling, data

2 Inventory
   ➢ Lack of control
   ➢ Too much in information
   ➢ Complicated retrieval
   ➢ Outdated information, obsolete information

3 Transportation
   ➢ Information incompatibility
   ➢ Software incompatibility
   ➢ Communications failure
   ➢ Security issues

4 Unnecessary Movement
   ➢ Unnecessary Handoffs
   ➢ Lack of direct access
   ➢ Reformatting

5 Waiting
   ➢ Late delivery of information
   ➢ Delivery too early (leads to rework)

6 Defective Products
   ➢ Haste
   ➢ Lack of reviews, tests, verifications
   ➢ Requirement is for information or knowledge and data is delivered

7 Processing
   ➢ Unnecessary serial production
   ➢ Excessive/custom formatting
   ➢ Too many iterations
Alternate definitions

- **Over Production**
  - Too much detail
  - Unnecessary Information
  - Redundant Development (Reuse not practiced)

- **Transportation**
  - Information/Software incompatibility
  - Communications failure
  - Not standards based
  - Multiple sources
  - Incompatible destinations requiring multiple transport

- **Waiting**
  - Information created too early
  - Late delivery of information
  - Unavailable information
  - Quality suspect

- **Inventory**
  - Too much information
  - Incomplete content
  - Poor configuration management

- **Unnecessary Movement**
  - Information User not Connected to sources, requiring manual intervention
  - Information Pushed to Wrong People

- **Processing**
  - Unnecessary serial processing
  - Lack of needed information
  - Poor/Bad decisions affecting future
  - Excessive/Custom processing
  - Not processed per process
  - Too many iterations/cycles
  - Excessive data conversion
  - Excessive verification
  - No transformation instructions
  - Decision criteria unclear
  - Working with wrong level of detail
  - Propagation of bad decisions
  - Processing of defective information
  - Multiple tasking when not required

- **Defective Product**
  - Quality lacking or suspect
  - Conversion error
  - Wrong level of information, i.e., need information/knowledge, received data
  - Incomplete information
  - Ambiguous information
  - Inaccurate information
  - Tolerance exceeded
  - Poor configuration management
Ward’s nine Wastes

➢ Hand-offs
➢ Useless information
➢ Discarded knowledge
➢ Wishful thinking
➢ Testing to spec.
➢ Waiting
➢ Ignored expertise
➢ Scatter
➢ Wrong tool

PD may have unique wastes
Nothing sacred about the seven
5 S (Straighten, Sort, Shine…)

➢ Take the time to produce a productive work environment *for you*
➢ NOT about mandatory housekeeping rules
➢ Applies directly to your cube
➢ Applies directly to your e-desktop: sort, filter, script..
Single Minute Exchange of Dies (vs. *days*) *revolutionized* Toyota production system

A great deal of engineering work is set-up!

Set-up!

Revolutionize this!
Flow and Pull

➢ Flow achieved when PD processes move and communicate without errors or waiting

➢ 62% of tasks idle at any given time (detailed member company study)

➢ 50-90% task idle time found in Kaizen-type events

➢ Pull achieved when PD can be completed inside the customer’s decision cycle time

We have a long way to go...
➢ Strive for *perfection*, NOT improvement or competitor benchmarks

➢ A neglected lean principle: Use the capabilities and knowledge of the *people doing the tasks*

*Engineers hate to be told what to do*

*Engineers are perfectionists*

*Turn a barrier into an enabler!*
Summary

➢ “Classic” lean can apply to PD processes
  ➢ Especially to (but not limited to) repeated design processes
➢ Value defined
➢ Value stream tools exist
➢ Lean tools apply with some interpretation
➢ Participation and control by people in the process is a key enabler

Change incremental, but strive for perfection