

**DRM ASSOCIATES
EXPERIENCE & CAPABILITIES
WITH LEAN PRODUCT
DEVELOPMENT (LPD)**

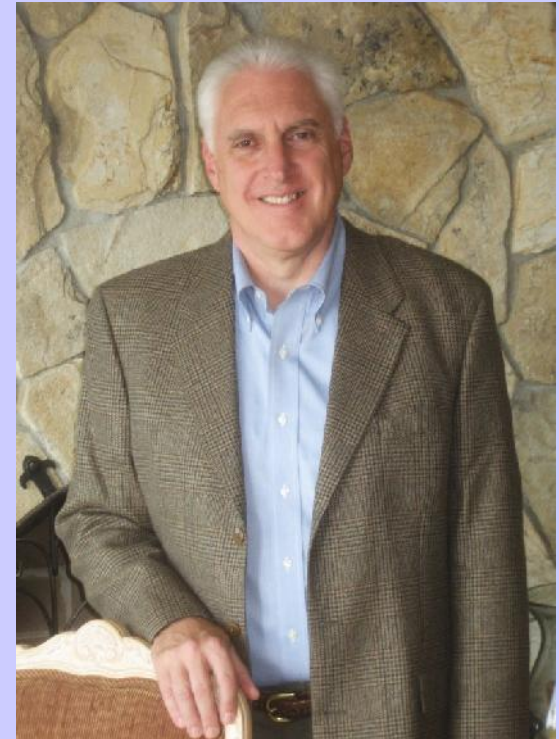
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DRM ASSOCIATES

- Firm with recognized expertise in lean product development & core focus on value
- Kenneth Crow is the firm's Principal consultant
- Nine highly-experienced consultants
- Extensive client list - Fortune 500 and international clients
- Led consortium to identify 270 best practices of product development
- Extensive training experience and materials - conducted over 200 workshops

KENNETH CROW

- 35+ years consulting in product development & manufacturing
 - Former Director, Mfg. Consulting, Ernst & Young
 - President, DRM Associates
- Recognized expert in lean product development, lean design, design to cost, QFD, DFM/A and other lean practices
- Certified New Product Development Professional
- Frequent international speaker and author
- Co-Founder, Former President & Director of the Society of Concurrent Product Development



OTHER DRM CONSULTANTS

Jim Rains

- Expert in value analysis/function analysis, design to cost, and lean manufacturing. Value analysis projects have averaged 20% cost savings



Pete Cornish

- Expert in lean project management and pipeline and portfolio management



Lee Shaeffer

- Expert in lean product development, design to cost, and quality function deployment



LPD CLIENTS

We have performed Lean Product Development and Lean Design training & consulting for the following companies

- Brady Corporation (2 business units)
- Curtiss Wright (3 business units)
- Direct Energy
- DTS, Inc.
- Emerson (2 business units)
- FEMSA Imbera
- Gambro Dasco
- General Dynamics (4 business units)
- Gentex
- Harman International
- Hewlett Packard (6 business units)
- Hollister (4 business units)
- Lighting Technologies
- Irkut Corporation/Yakovlev Design Bureau
- ITT Night Vision
- John Deere (5 business units)
- Johnson & Johnson
- L3 Communications
- Lord Corporation
- Medtronic
- Northrop Grumman (3 business units)
- Power One
- Saft America
- Space Systems/Loral
- Spectrum Brands (2 business units)
- Sun Microsystems (6 business units)
- Toro (5 business units)
- Westinghouse Electric (2 business units)

REPRESENTATIVE EXPERIENCE

Westinghouse Electric We conducted multiple projects to cover various aspects of lean product development including collecting voice of the customer, planning requirements with QFD, improving their product development process, and applying lean design practices

Johnson & Johnson We have conducted training and helped integrate lean design principles into their DFSS-based product development process. This included design to cost, value engineering and design for manufacturability training and consulting.

Irkut Corporation We conducted training and helped implement lean product development practices for this Russian commercial aircraft manufacturer

Emerson Electric We conducted training in lean product development practices for multiple divisions and provided guidance in application of pipeline (flow) management and lean gate review practices

REPRESENTATIVE EXPERIENCE

Lighting Technologies We have provided a wide range of assistance in helping this major commercial lighting manufacturer implement lean product development practices:

- Conducted LPD training, developed plans to implement LPD practices, and provided LPD consulting
- Implemented portfolio management and resource management tools and a gate review process to control project flow in the development pipeline and reduce time-to-market
- Streamlined and standardized the development process around several standard process models
- Implemented lean design practices and conducted training on design for manufacturability, target costing and design to cost
- Worked to overcome cultural impediments to implement cross-functional teams to improve communication, coordination and collaboration

REPRESENTATIVE EXPERIENCE

Westinghouse Electric We assisted their nuclear fuel division implement lean product development practices including the following:

- Defined a target costing/design to cost process and integrated it into their new product development process. We conducted target cost & design to cost training for key personnel. We help select and implement product cost estimating software to be used early in the development process to provide feedback on the cost implication of design decisions.
- Conducted training on quality function deployment and facilitated use of QFD on four major programs define customer needs, develop a product strategy to maximize customer value, and plan product requirements
- Facilitated brainstorming sessions and the development of concept alternatives to meet aggressive cost targets. On this program, this lean design process led to a product that provided this additional functionality at a significantly reduced cost from the previous design.
- Helped define a standardized product development process based on LPD practices and conducted training in the new process

REPRESENTATIVE EXPERIENCE

General Dynamics Land Systems-Canada We reviewed the products, operations and development process in these business unit. We developed and conducted customized lean design workshops on Integrated Product Development, Design for Manufacturability/ Assembly, Design for Maintainability which included recommended process steps to improve their development process.

Lord Corporation We reviewed the products, operations and development process in their aerospace, automotive, commercial and chemical business units and provided recommendations to incorporate lean design practice and design to cost (DTC) in the development process. We developed and conducted customized DTC workshops for personnel in three business units as well as a management workshop to gain management commitment to a lean design program.

REPRESENTATIVE EXPERIENCE

Space Systems / Loral We provided design to cost (DTC) and lean product development (LPD) assistance to SS/L in their pursuit of the next generation Iridium satellite constellation. In this hands-on role, we:

- Helped to establish NRE and RE cost targets for program elements
- Suggested changes in business models & contractual relationships with team members to incentivize a more unified DTC and LPD approach
- Helped to define DTC roles and responsibilities within the program and the supporting functional organizations
- Refined cost models and cost reporting
- Supported requirements and cost trades
- Assisted with identifying, quantifying and mitigating cost risks
- Introduced DTC & DFM/A methods & techniques as appropriate and facilitated a DTC approach with teams at all levels of the program
- Played the role of the DTC consciousness in the program

REPRESENTATIVE EXPERIENCE

Sun Microsystems We directed a program to implement lean design practices and design for manufacturability across all of their hardware business units. We worked with management to obtain commitment to this initiative and plan the overall program. We assisted them define a lean design/DFM process and integrated it into their product development process. We conducted training on design for manufacturability across the enterprise. We facilitated application of this process for multiple programs. We helped address issues that came up with the initiative and its application to development programs.

Toro We guided a program to implement lean design and design for manufacturability for this lawn care equipment manufacturer across multiple US business units. We worked with management to plan the overall program. We assisted them define a lean design & DFM process and integrated it into their product development process. We conducted training on design for manufacturability in each of the business units. We supported many programs by conducting DFM reviews of their designs. We helped address issues such as getting the necessary manufacturing engineers to support this initiative.

REPRESENTATIVE EXPERIENCE

Hewlett Packard We provided consulting and training to six HP business units covering a variety of lean product development and lean design practices such as the following:

- Consulting and training related to developing a standardized product development process based on LPD practices in the servers, storage and networking business units
- Lean Design and Design for Manufacturability for business units in Shanghai, Israel and Singapore for consumer printers and industrial printing equipment
- Lean Design and Design for Serviceability training for industrial printing equipment in Europe and the US
- Lean Design and Design to Cost consulting for desktop and notebook computers business unit and the industrial printers business unit

LPD SERVICES

LPD Process Assessment

- Assess the current development process, gather data, and perform value stream mapping where appropriate

Training

- Conduct Lean Product Development Workshop and other related workshops

LPD Process Implementation

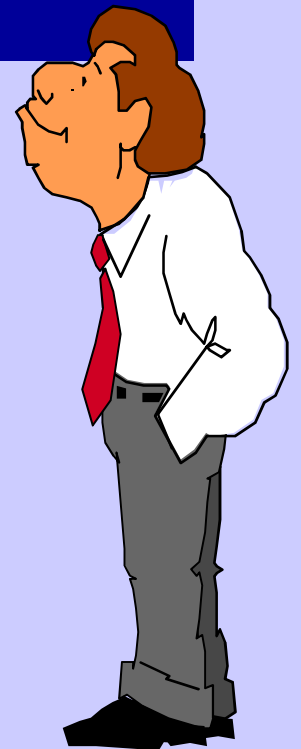
- Assist in leaning the process; establish supporting practices, tools and methodologies; and create appropriate metrics

LPD Project Facilitation

- Facilitate project teams with lean project planning, using lean practices, and developing lean designs

LEAN THINKING

Lean refers to a way of thinking and specific practices that emphasize less of everything – less resources, less work-in-process, less time, and less cost – to produce something, either a physical product, knowledge product (e.g. product design), or service product.



LEAN PD PRACTICES & TOOLS

		Lean Product Development Practices and Tools																	
		Voice of the Customer	Quality Function Deployment	Lean Design	Platforms & Design Reuse	Rapidly Explore Alternatives	Streamline the PD Process	5S Workplace	Standardized Work	Design Tool Integration	Pipeline Management	Flow Process & Pull Scheduling	Reduced Batch Sizes	Synchronize Activities	Delay Commitment	Cross Functional Team	Workforce Empowerment	Right Resources	Amplify Learning
Practice Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Define and maximize value to the customer		■	■	■	■	■													
2. Identify the value stream & eliminate waste				■	■		■	■	■	■				■					
3. Make the value-creating steps flow					■					■	■	■	■	■	■				
4. Empower the team																■	■	■	
5. Learn and improve																			■

LEAN PD PRACTICES

1. **Voice of the Customer** provides an input to maintain focus on what is of value to the customer.
2. **Quality Function Deployment** transforms customer needs into product specifications and plans oriented to maximizing the customer value proposition.
3. **Lean Design** minimizes waste (high cost and poor quality) and maximize value in the design of the product.
4. **Platforms and Design Re-Use** to reduce the cost of development, increase product value, and enable smaller batch sizes.
5. **Rapidly Explore Alternatives** is important to develop more optimal solutions to maximize customer value. Set-based design explores alternatives in parallel, gradually narrowing alternatives until the solution emerges.
6. **Streamline the Development Process** to avoid unnecessary gates and procedures. Use value stream mapping to eliminate waste.
7. **5S Workplace** organizes workplace and data to minimize time needed to find information and perform development activities.
8. **Standardized Work** establishes a common way of doing things – standard process, document templates, checklists, etc.
9. **Design Tool Integration** integrates design tools (e.g., CAD/CAE/CAM) to improve the process and reduce cycle time

LEAN PD PRACTICES

- 10. Pipeline Management** avoids overloading the pipeline, smoothes out release of work, and prevents buildup of work-in-process and queue time.
- 11. Flow Process and Pull Scheduling** pulls work in a steady flow when resources are available. Team planning and visual management provide a better understanding of development status and required actions.
- 12. Reduce Batch Sizes** through standardization and platform development, working without complete information, etc., which allows a smoother flow and more level staffing.
- 13. Synchronize Activities** frequently with project team members and use tools like design structure matrix to understand interactions and visual management techniques to determine status and issues.
- 14. Defer Commitment** where appropriate to keep options open and respond to change, avoiding premature decisions and generating greater customer value.
- 15. Cross-Functional Team** is a way to create a workcell with required disciplines to more rapidly conduct development activities.
- 16. Workforce Empowerment** enables teams to plan their own projects and determine how to best provide value to the customer.
- 17. Right Resources** in terms of the right number of people, at the right times, and with the right skills and experience enable lean product development.
- 18. Amplify Learning** with knowledge capture and feedback and use iterative development to take advantage of learning.

LPD WORKSHOP AGENDA

1. Voice of the Customer
2. Quality Function Deployment
3. Lean Design
4. Platforms and Design Re-Use
5. Rapidly Explore Alternatives
6. Value Stream Mapping
7. 5S Workplace
8. Standardized Work
9. Integrate Design Tools
10. Pipeline Management
11. Flow Process and Pull Scheduling.
12. Reduce Batch Sizes
13. Synchronize Activities
14. Delay Commitment
15. Cross-Functional Team
16. Workforce Empowerment
17. Right Resources
18. Amplify Learning

For further information on the workshop, see
www.npd-solutions.com/leanws.html

LPD EXPERT SERIES WORKSHOPS

Lean Project Management (2 days)

See www.npd-solutions.com/leanpmws.html

Voice of the Customer (2 days)

See www.npd-solutions.com/vocws.html

Quality Function Deployment (3 days)

See www.npd-solutions.com/qfdws.html

Target Costing / Design to Cost (3 days)

See www.npd-solutions.com/targetws.html

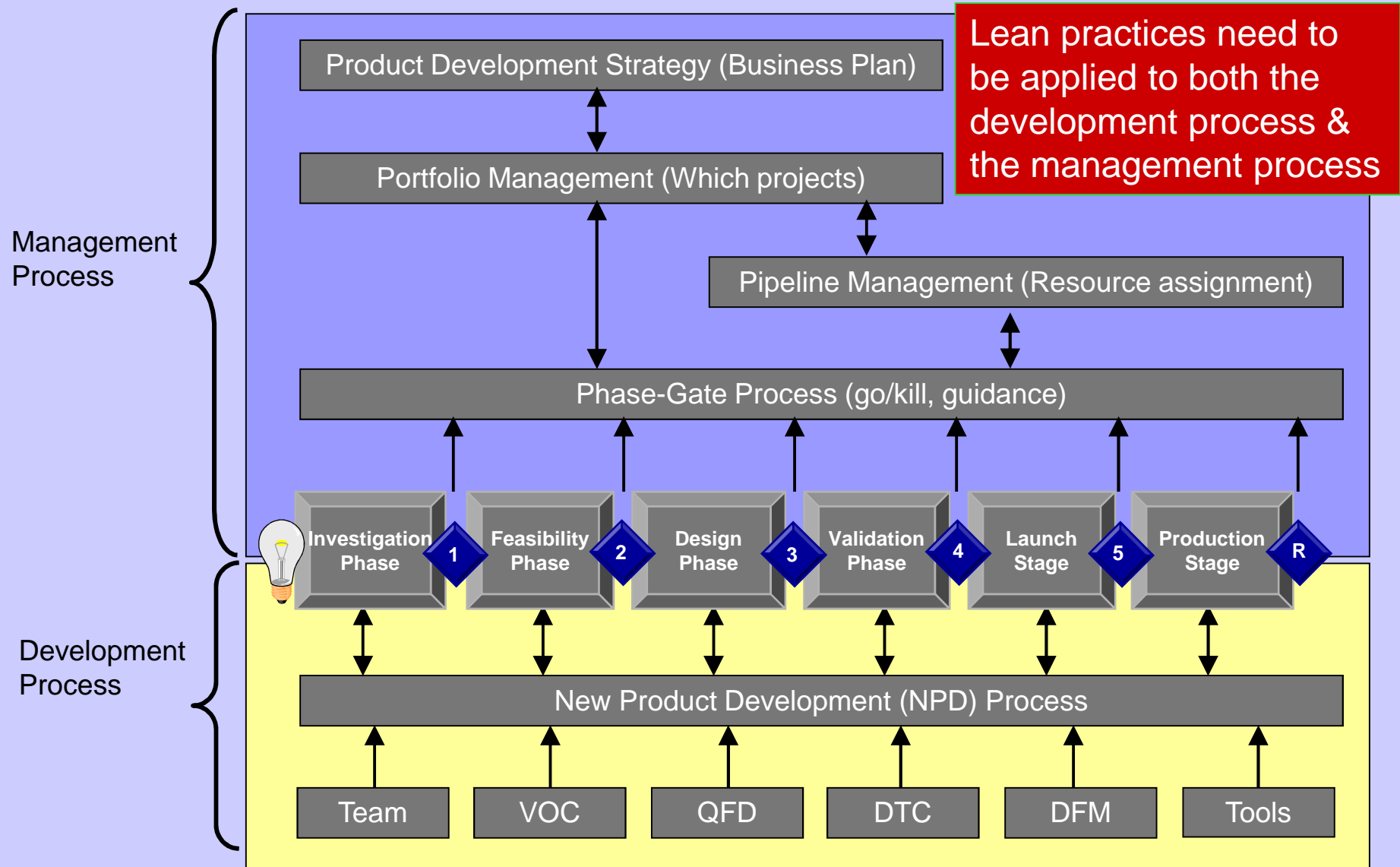
Design for Manufacturability/Assembly (3 days)

See www.npd-solutions.com/dfmws.html

Value Analysis/Value Engineering (3 to 5 days)

See www.npd-solutions.com/vamod1ws.html

PRODUCT DEVELOPMENT PROCESS



IMPLEMENTATION OF LPD

- Define process based on LPD principles & practices
 - Development process
 - Management process
- Train personnel in LPD principles and practices
- Implement supporting methodologies and tools
- Facilitate project application of LPD practices: project planning, empowered teams, VOC, QFD, lean design, flow process, project synchronization, and other practices
- Facilitate management application of practices: pipeline management and gate reviews