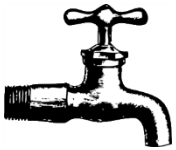
go with the flow

why Lean ideas work
so well in Software

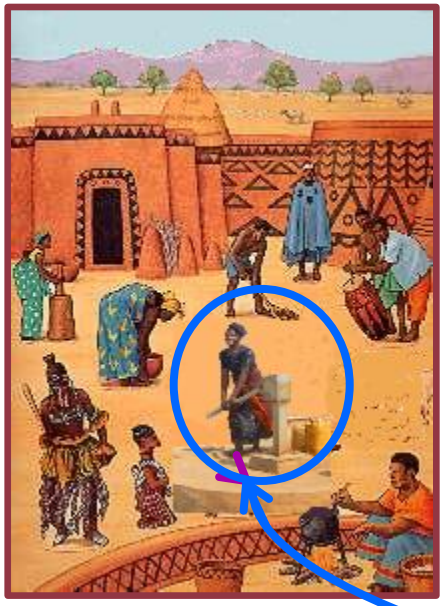
Lean: a general paradigm for human productivity

4. Initiate value stream when customer wants the value



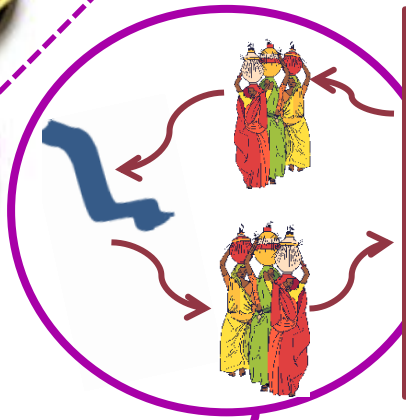
5. Eliminate defects and unwanted additions to the value delivered

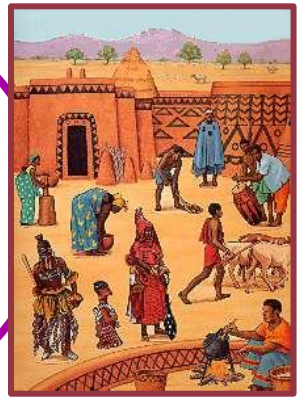
3. Tighten and eliminate discon-tinuities in the value stream



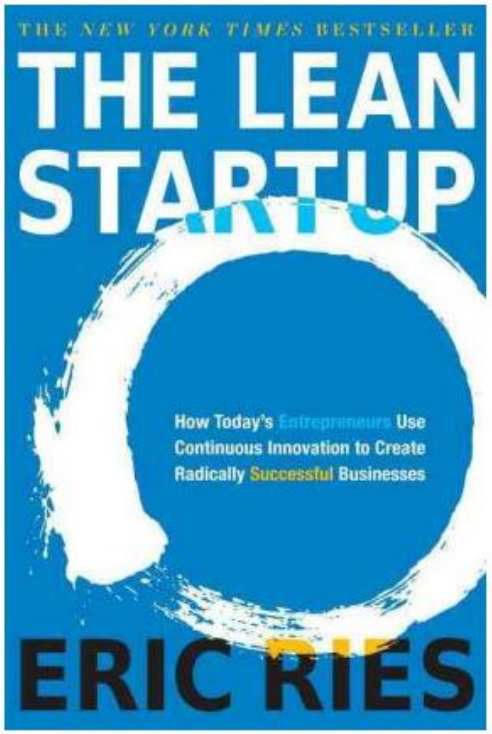
1. Identify what the customer really wants or needs

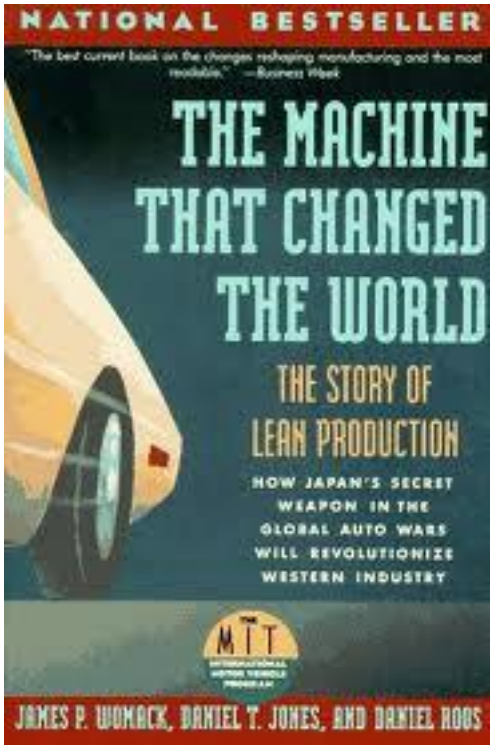
2. Identify what happens to deliver the value to the customer

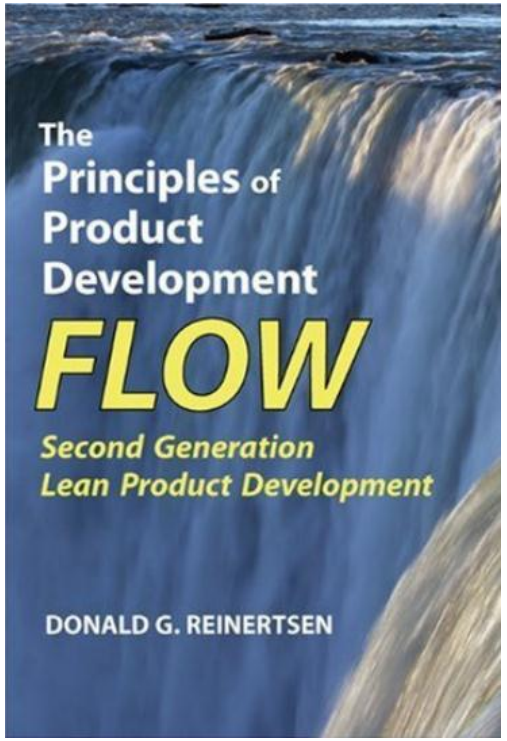




Lean: a general paradigm for human productivity







"How do you apply the fifty-year-old ideas of **Lean** to the fast-paced, **high-uncertainty world of startups**? This book provides a…practical answer"

Don Reinertsen

" Instead of spending time and energy trying to remove variability, you will learn to use it to your advantage."

Mikael Lundgren
Citerus AB

paradigm

“a philosophical and theoretical framework…within which theories, laws, and generalizations and the experiments performed in support of them are formulated”

merriam-webster.com

Craft

Tools

Skills

Community. Flexibility.

manifesto.softwarecraftsmanship.org

Mass

Machines

Process

"Process: A series of operations performed in the making or treatment of a product"

thefreedictionary.com

Scale. Predictability. Speed.

"Tools do not think, people think, Lean is about people not tools"

Kathy Balsley, SAP

Community.

Flexibility.

Scale.

Predictability.

Speed.

Focus.

Synergy.

Lean

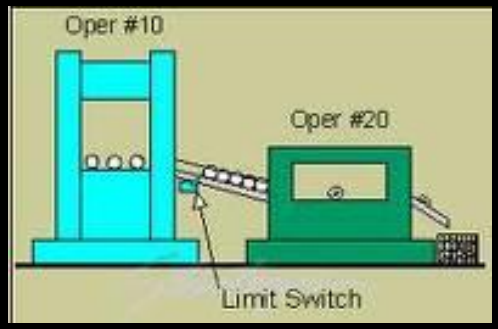
is not a

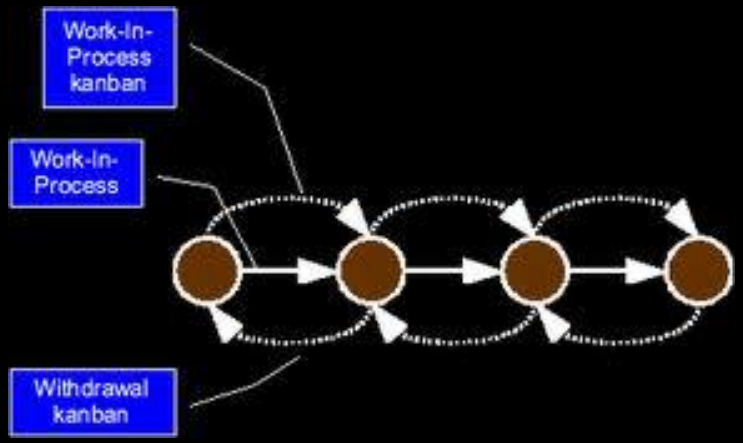
toolset

Lean factory-floor tools

Andon lights

Autonomation



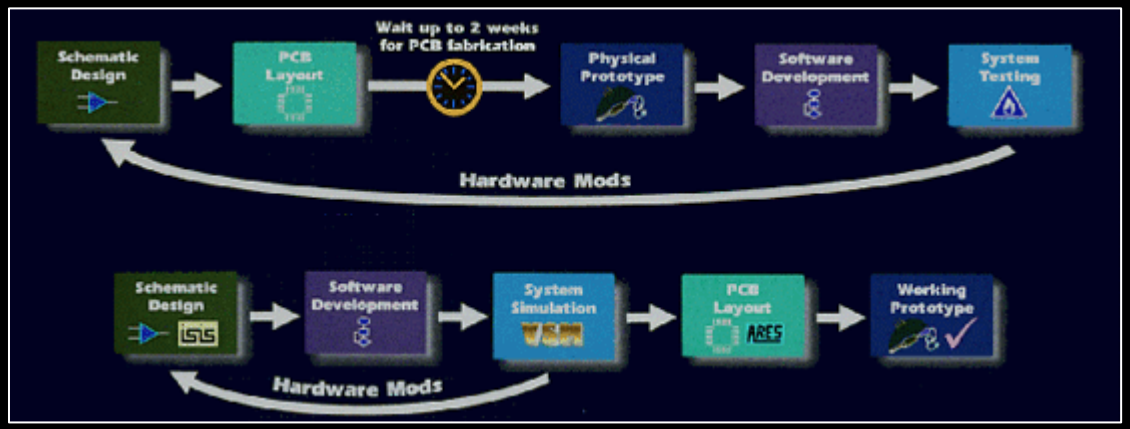


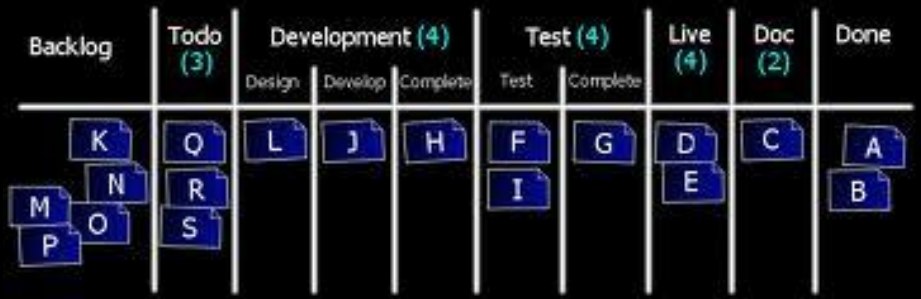
Lean knowledge-work tools

QFD

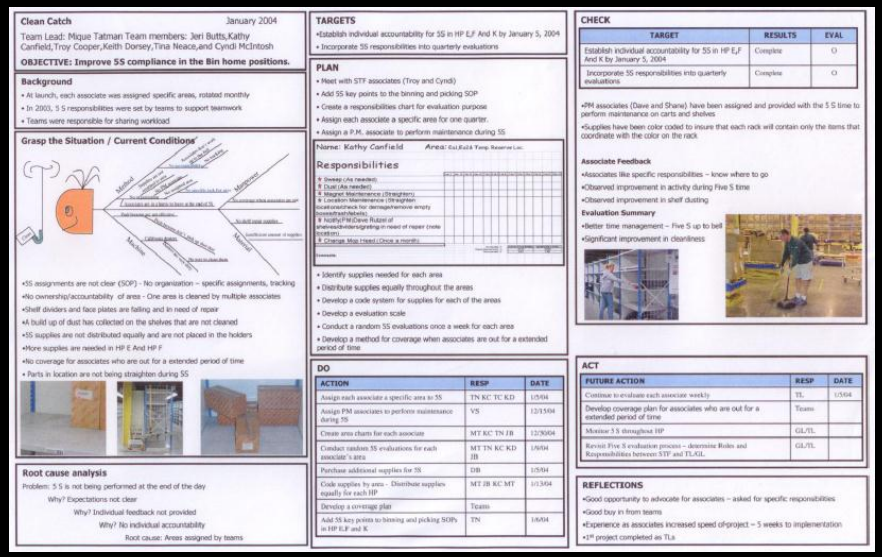
	Priorities	Postt	GeminaSoft	Oracle7	SQLAnywhere
Java compatible	.1	9	9	3	3
easy to interface to an O-O App	.3	9	9	1	1
price/ royalties	.3	9	3	3	9
locking granularity	.2	9	9	3	3
nested transactions	.1	1	3	3	3
score		8.2	6.6	2.4	4.2

VSM

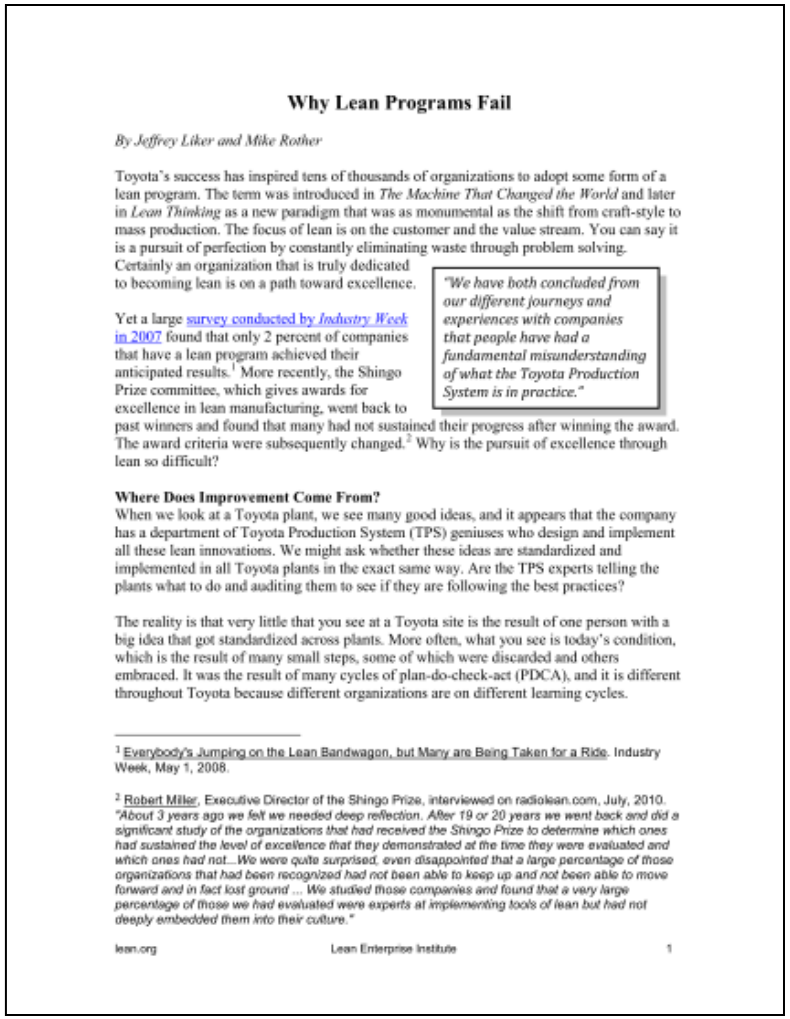




A3



Yet … Lean has failed



Why Lean Programs Fail

By Jeffrey Liker and Mike Rother

Toyota's success has inspired tens of thousands of organizations to adopt some form of a lean program. The term was introduced in *The Machine That Changed the World* and later in *Lean Thinking* as a new paradigm that was as monumental as the shift from craft-style to mass production. The focus of lean is on the customer and the value stream. You can say it is a pursuit of perfection by constantly eliminating waste through problem solving. Certainly an organization that is truly dedicated to becoming lean is on a path toward excellence.

> *"We have both concluded from our different journeys and experiences with companies that people have had a fundamental misunderstanding of what the Toyota Production System is in practice."*

Yet a large survey conducted by *Industry Week* in 2007 found that only 2 percent of companies that have a lean program achieved their anticipated results.[1] More recently, the Shingo Prize committee, which gives awards for excellence in lean manufacturing, went back to past winners and found that many had not sustained their progress after winning the award. The award criteria were subsequently changed.[2] Why is the pursuit of excellence through lean so difficult?

Where Does Improvement Come From?

When we look at a Toyota plant, we see many good ideas, and it appears that the company has a department of Toyota Production System (TPS) geniuses who design and implement all these lean innovations. We might ask whether these ideas are standardized and implemented in all Toyota plants in the exact same way. Are the TPS experts telling the plants what to do and auditing them to see if they are following the best practices?

The reality is that very little that you see at a Toyota site is the result of one person with a big idea that got standardized across plants. More often, what you see is today's condition, which is the result of many small steps, some of which were discarded and others embraced. It was the result of many cycles of plan-do-check-act (PDCA), and it is different throughout Toyota because different organizations are on different learning cycles.

[1] Everybody's Jumping on the Lean Bandwagon, but Many are Being Taken for a Ride. Industry Week, May 1, 2008.

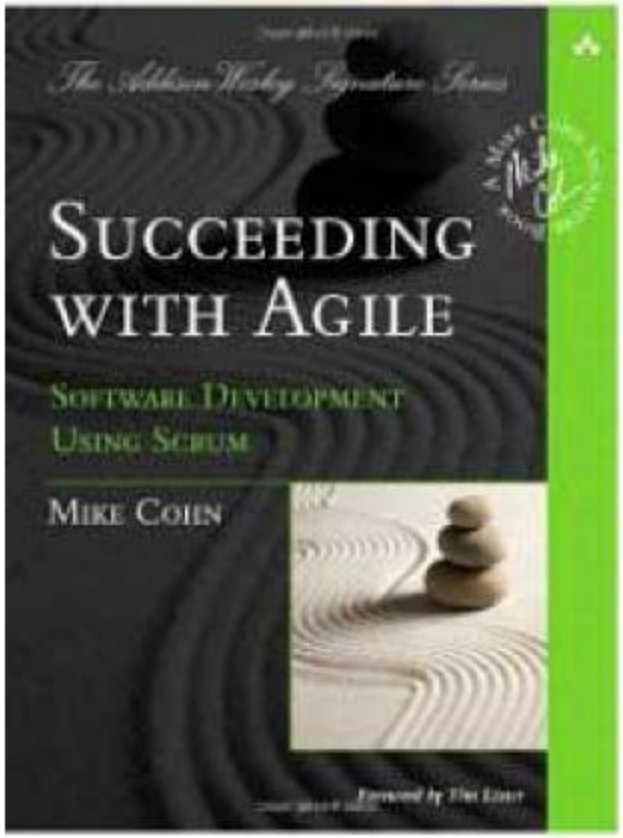
[2] Robert Miller, Executive Director of the Shingo Prize, interviewed on radiolean.com, July, 2010. *"About 3 years ago we felt we needed deep reflection. After 19 or 20 years we went back and did a significant study of the organizations that had received the Shingo Prize to determine which ones had sustained the level of excellence that they demonstrated at the time they were evaluated and which ones had not...We were quite surprised, even disappointed that a large percentage of those organizations that had been recognized had not been able to keep up and not been able to move forward and in fact lost ground ... We studied those companies and found that a very large percentage of those we had evaluated were experts at implementing tools of lean but had not deeply embedded them into their culture."*

lean.org Lean Enterprise Institute 1

"**only 2 percent** of companies that have a lean program achieved their anticipated results"

"Why Lean Programs Fail", by Jeffrey Liker ("The Toyota Way") and Mike Rother ("Toyota Kata")

… Agile has failed …

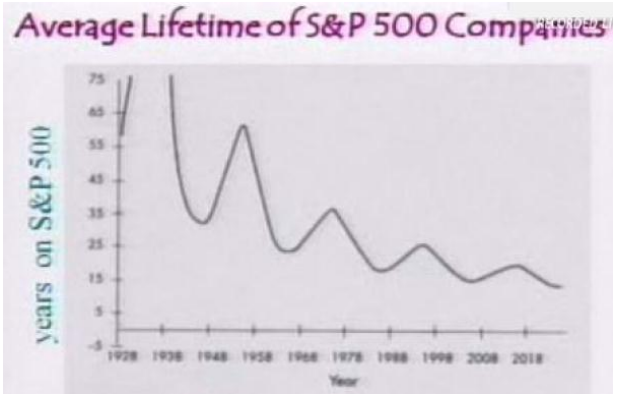


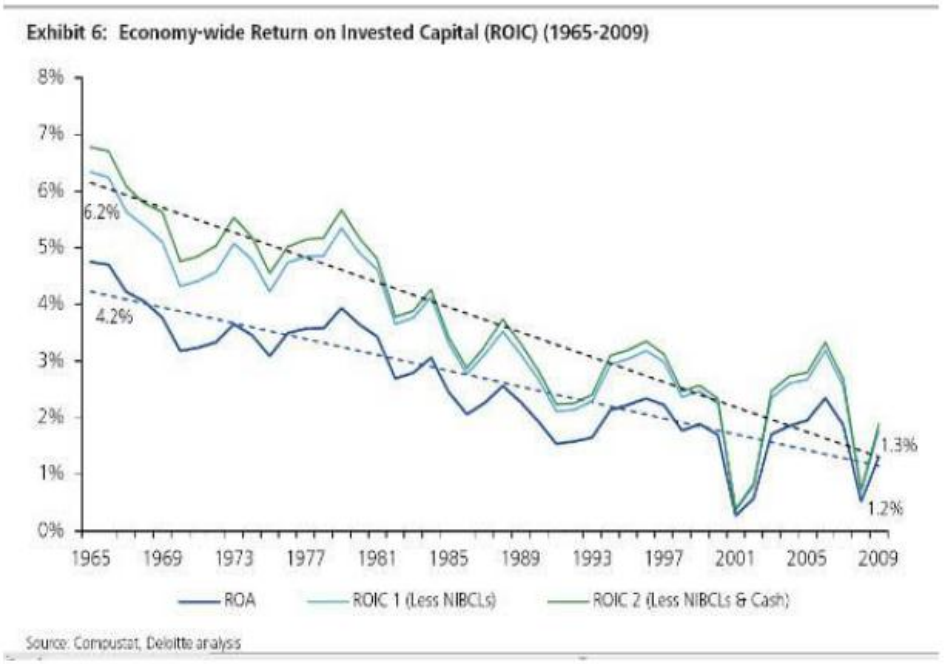
More than 70% of Agile initiatives fail to meet their goals.

… and Traditional Mgt has failed

75% decline in ROIC

S&P500 lifespan -> 5 years





"**return on assets** for U.S. companies has steadily fallen

to almost one quarter of 1965 levels

at the same time that we have seen continued … improvements in labor productivity."

Source: Deloitte's Center for the Edge: The Shift Index (2009)

Why?

paradigm

a “within” implies a “without’:
i.e., a surrounding environment

“a philosophical and theoretical framework…within which theories, laws, and generalizations and the experiments performed in support of them are formulated”

merriam-webster.com

The Mass-Paradigm Environment / Worldview

Mass production lives in a world where products are made using:

- big, expensive tools (machines, software packages), in
- expensive facilities, all of which are
- run or serviced by expendable, expensive people

Everything is governed by the Unit Cost Equation:

$$\text{Unit Cost}(op_i) = \frac{\$DL_{(Op_i)} + \$MTL + \$OVHD_{(Op_i)}}{n}$$

$$\ldots\text{where } \$OVHD(op_i) = \frac{\text{DL Hours } (Op_i)}{\text{Total Plant DL Hours}} \left(\$OVHD_{total}\right)$$

$$n = \text{number of parts produced per hour (rate)}$$

In this, <u>your only tools to improve profits</u> are:

- Cut "DL" Direct Labor (people, their pay, or both)
- Cut "MTL" Materials costs
- Cut "OVHD" Overhead costs
- Increase the number of products made per hour

Cut people / outsource

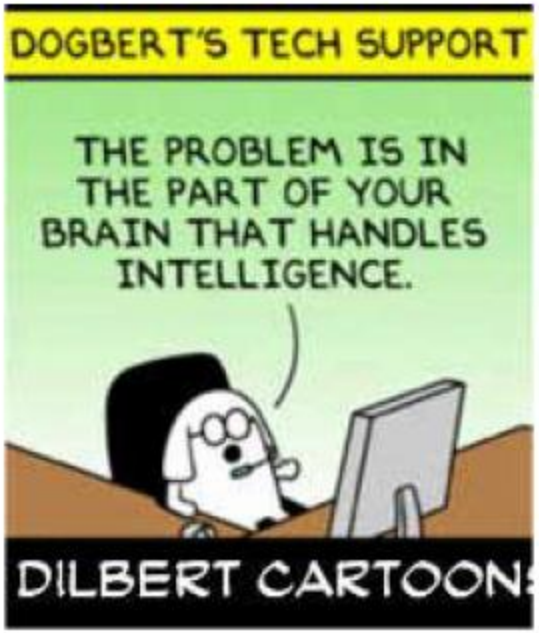
Cut quality

Managers hate their own jobs!

The Three Most Hated Jobs in the USA

1. Director of Information Technology
2. Director of Sales and Marketing
3. Product Manager

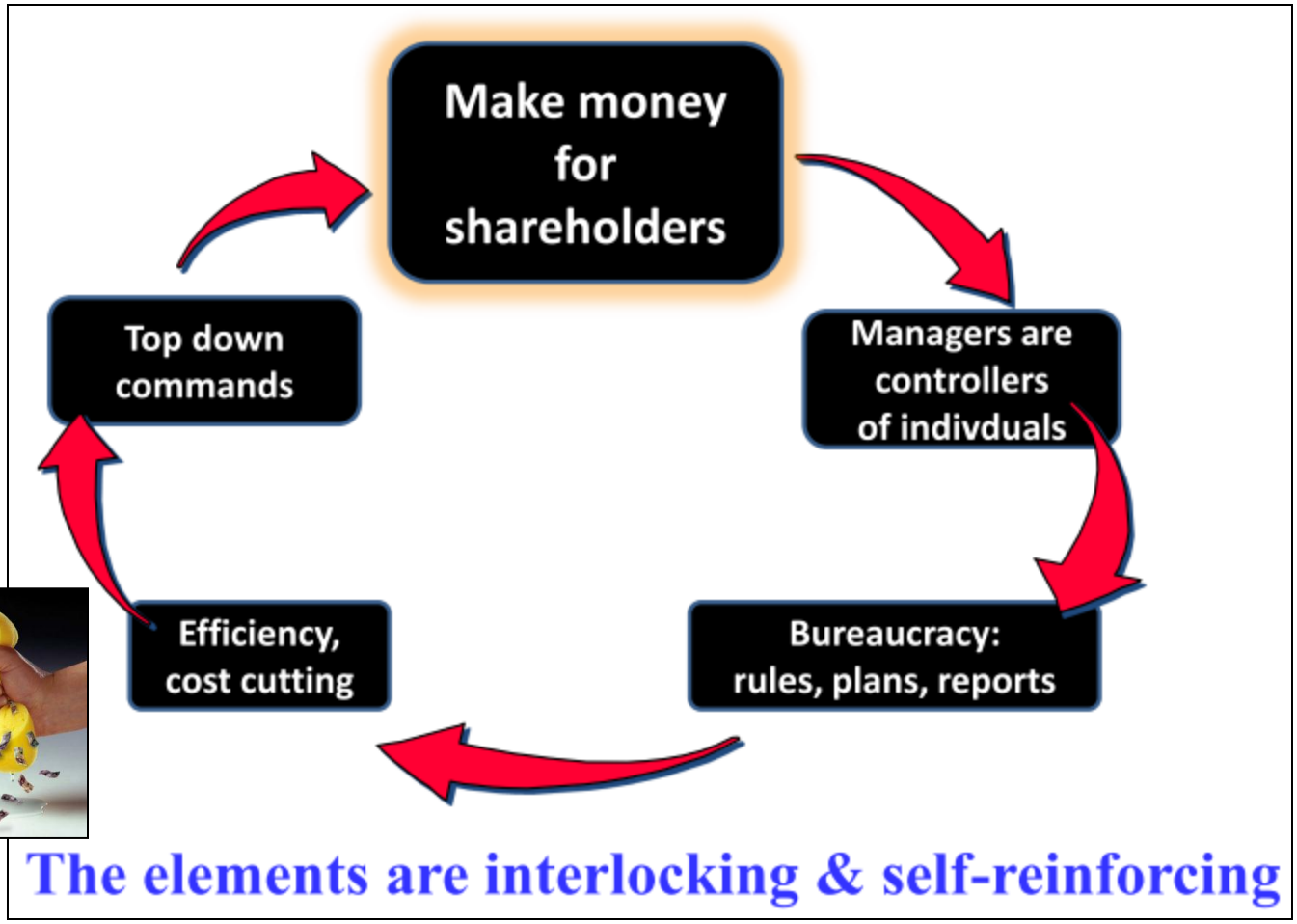
These are bad situations, not bad people



http://www.forbes.com/sites/stevedenning/2011/08/11/think-your-job-is-bad-try-one-of-these/

Graphic courtesy of Steve Denning

Mass Paradigm Management Principles



Graphics courtesy of Steve Denning

Beyond Budgeting® ROUND TABLE

"It is both scary and amazing to observe

how little management practices have developed over the last fifty years,

a period where we have seen groundbreaking innovation in most other parts of business and technology. My sons who now are finalizing their business studies

could easily have used many of my own textbooks from thirty years ago,

especially those covering budgeting, planning and performance management. Most business schools still teach, and

most companies still practice a "command-and control" approach"

Statoil

Bjarte Bogsnes,
VP Performance Management Development, Statoil
world's 13th-largest oil and gas producer;
"#1 most-admired company in petroleum sector"

The Lean Environment

"Lean culture is characterised by people first

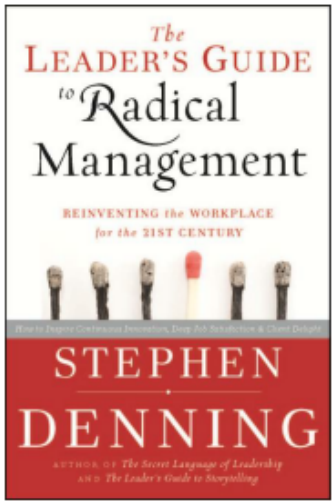
- **strong customer orientation**
- **trust**

"The human dimension is the single most important element"

Thorsten Arens

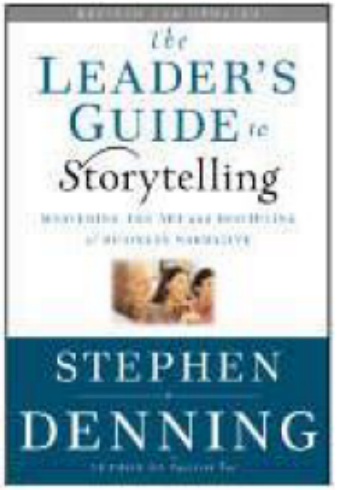
Strong Customer Orientation

Making The Entire Firm Lean & Agile



Steve Denning

Steve's daily blog on Forbes
http://blogs.forbes.com/stevedenning/

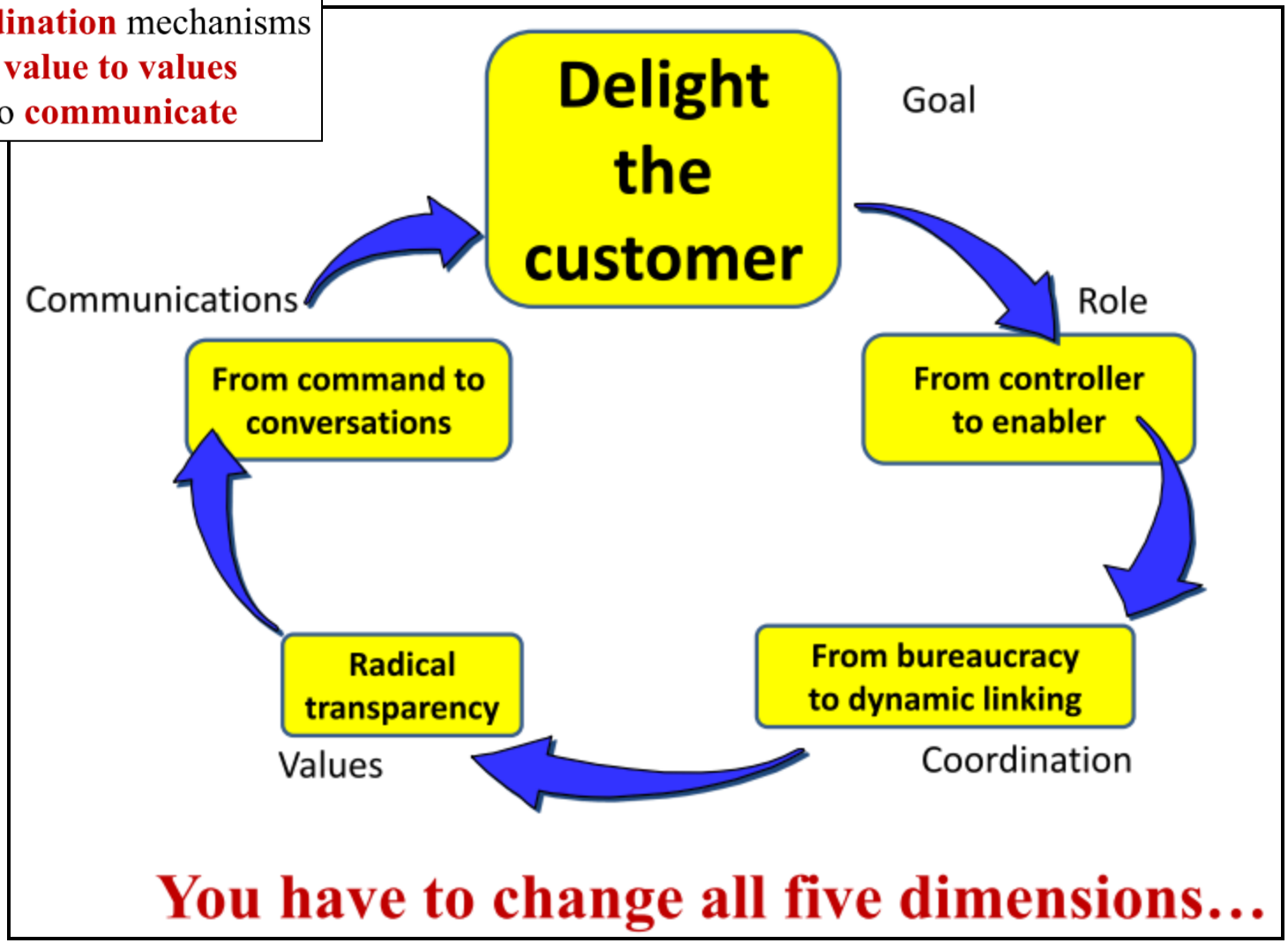


These slides:
http://www.stevedenning.com/slides/Stockholm.pdf

Graphic courtesy of Steve Denning

To get lasting change, we need all at once

1. **New goal** for the organization
2. **New role** for managers
3. **New coordination** mechanisms
4. Shift **from value to values**
5. New way to **communicate**



Graphics courtesy of Steve Denning

A paradoxical discovery!

Customer delight

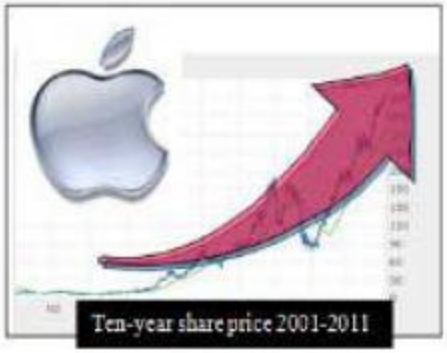
Costs come down of their own accord!

Graphics courtesy of Steve Denning

The difference is undeniable

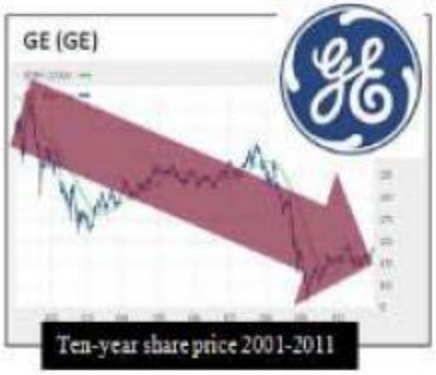
Radical management

a “Lean-friendly” environment

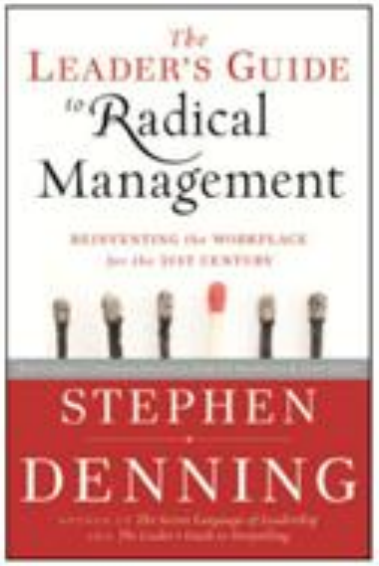


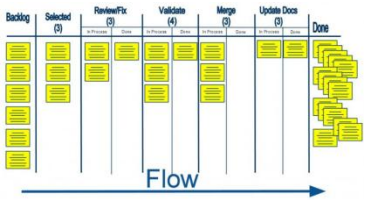
Traditional management

a “Mass-friendly” environment



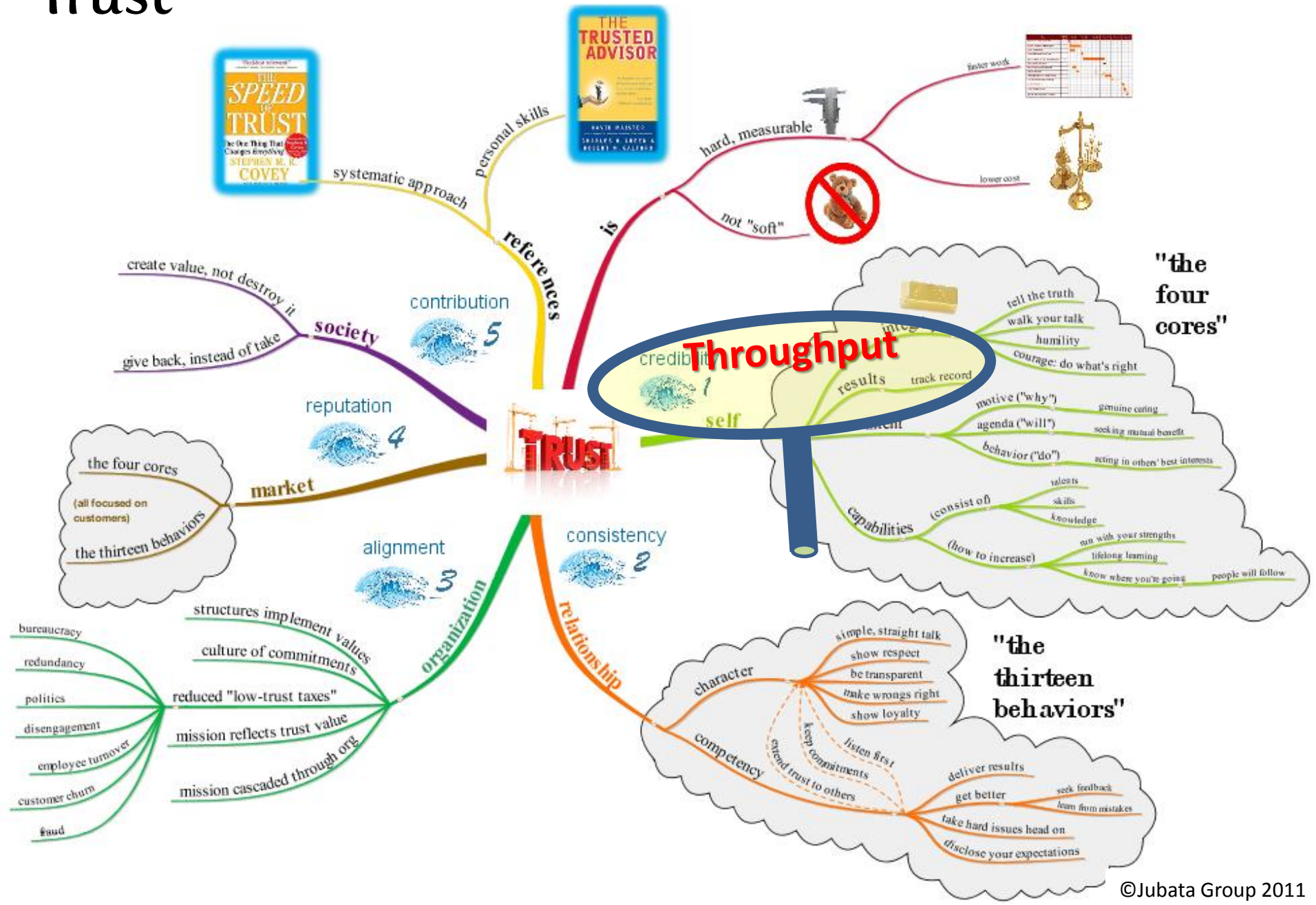
So, what can *you* do about your company's environment?



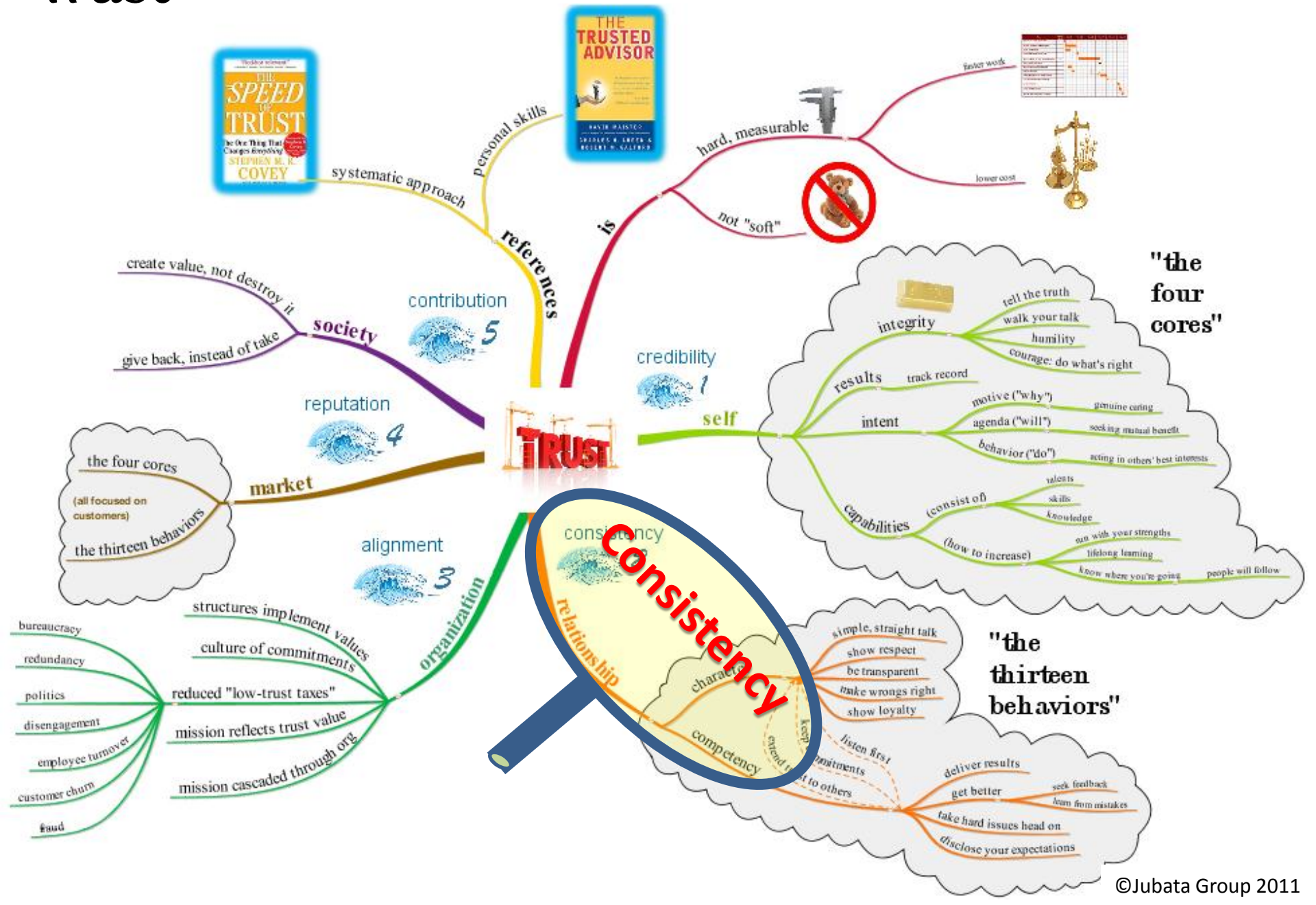


AND …

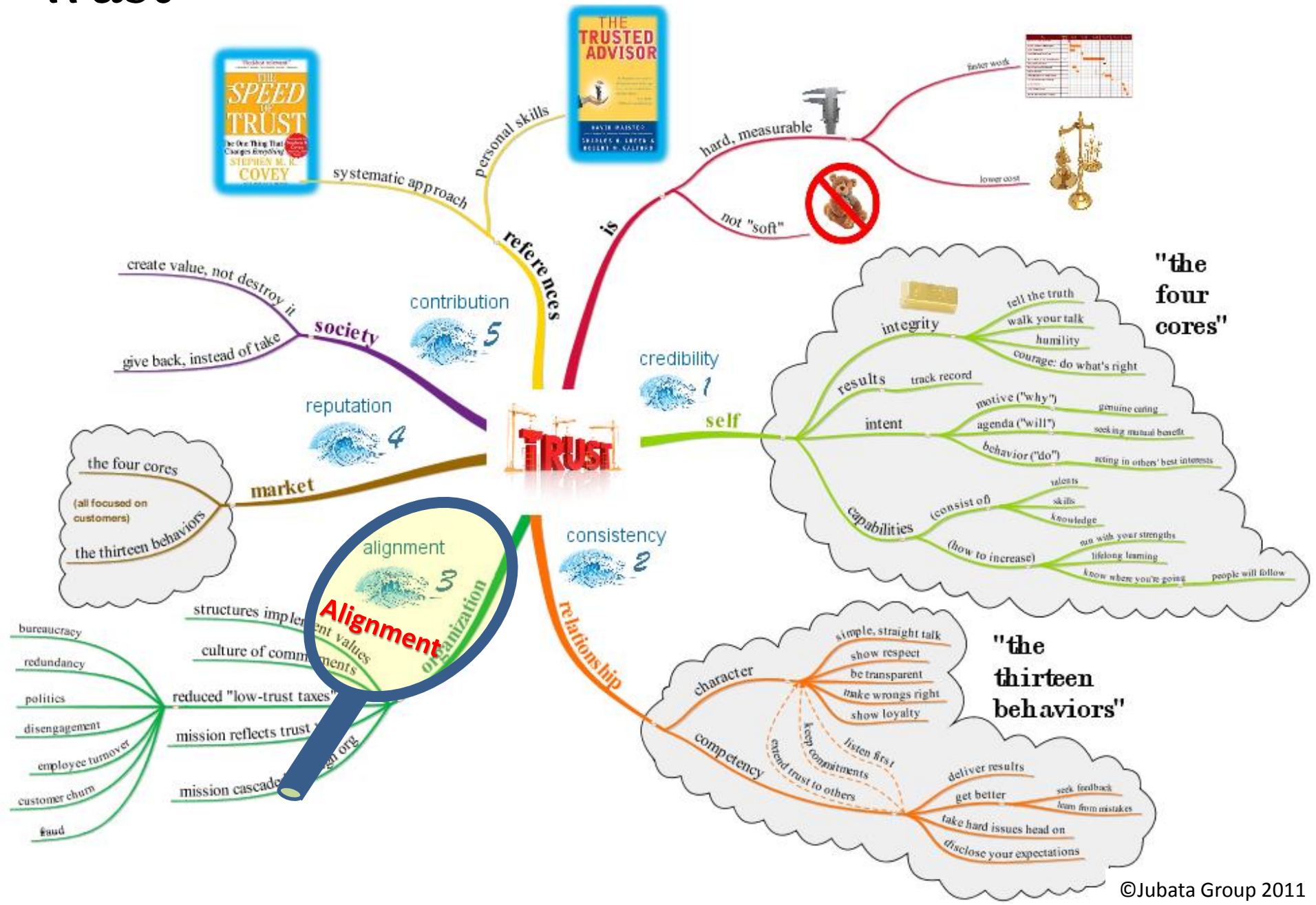
Trust



Trust



Trust



Lean in software development: Value

Building the *right* software

- Experimental, exploratory environment
- Understand the user's mission
  - What's most likely to change
  - What's most likely to stay same
- Anticipate future needs (GTI, Sensemaking)

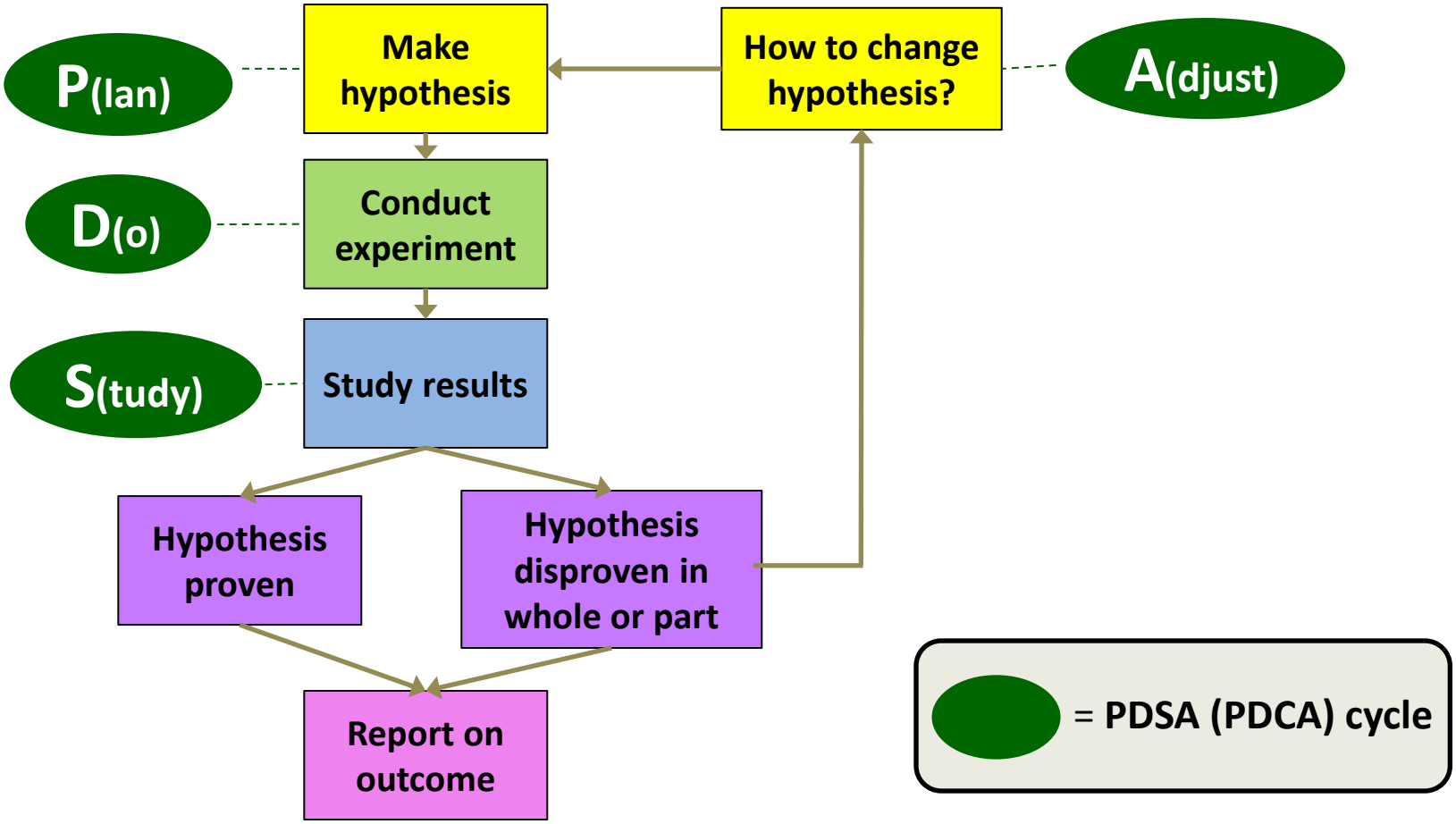
Hypothesis

: an idea or explanation for something that is based on known facts but has not yet been proved

Cambridge Dictionary

Experiment-based development

(the way most Agile *and* Lean projects implement it)



Lean A3: Starts with Hypothesis

Clean Catch January

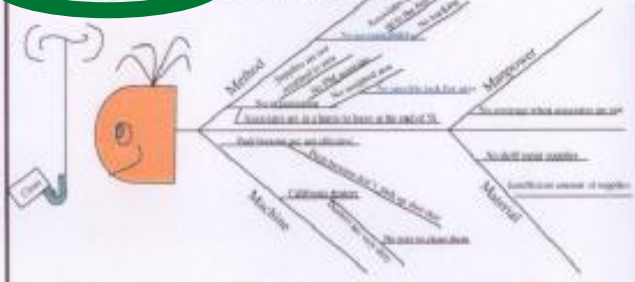
Team Lead: Mique Tatman Team members: Jen Butler, Kelly Canfield,Troy Cooper,Keith Dorsey,Tina Neace, Cyndi McIntosh

OBJECTIVE: Improve 5S compliance in the Bin home positions.

Background

- ...associate was assigned specific areas, rotated monthly
- In 2003, 5 S responsibilities were set by teams to support teamwork
- Teams were responsible for sharing workload

Grasp the Situation – Current Conditions



- 5S assignments are not clear (SOP) - No organization – specific assignments, tracking
- No ownership/accountability of area - One area is cleaned by multiple associates
- Shelf dividers and face plates are falling and in need of repair
- A build up of dust has collected on the shelves that are not cleaned
- 5S supplies are not distributed equally and are not placed in the holders
- More supplies are needed in HP E And HP F
- No coverage for associates who are out for a extended period of time
- Parts in location are not being straighten during 5S

Root cause analysis

Problem: 5 S is not being performed at the end of the day

Why? Expectations not clear

Why? Individual feedback not provided

Why? No individual accountability

Root cause: Areas assigned by teams

TARGETS

- ...dual accountability for 5S in HP E,F And K by January 5, 2004
- Incorporate 5S responsibilities into quarterly evaluations

PLAN

- ...STF associates (Troy and Cyndi)
- Add 5S key points to the binning and picking SOP
- Create a responsibilities chart for evaluation purpose
- Assign each associate a specific area for one quarter.
- Assign a P.M. associate to perform maintenance during 5S

Name: Kathy Canfield Area: Ea1,Ea2& Temp. Reserve Loc.

Responsibilities

Sweep (As needed)
Dust (As needed)
Magnet Maintenance (Straighten)
Location Maintenance (Straighten locations/check for damage/remove empty boxes/trash/labels)
Notify PM (Dave Rutzel of shelves/dividers/grating in need of repair (note location)
Change Mop Head (Once a month)

- Identify supplies needed for each area
- Distribute supplies equally throughout the areas
- Develop a code system for supplies for each of the areas
- Develop a evaluation scale
- Conduct a random 5S evaluations once a week for each area
- Develop a method for coverage when associates are out for a extended period of time

DO

...TION	RESP	DATE
Assign each associate a specific area to 5S	TN KC TC KD	1/5/04
Assign PM associates to perform maintenance during 5S	VS	12/15/04
Create area charts for each associate	MT KC TN JB	12/30/04
Conduct random 5S evaluations for each associate's area	MT TN KC KD JB	1/6/04
Purchase additional supplies for 5S	DB	1/5/04
Code supplies by area - Distribute supplies equally for each HP	MT JB KC MT	1/13/04
Develop a coverage plan	Teams	
Add 5S key points to binning and picking SOPs in HP E,F and K	TN	1/6/04

CHECK

TARGET	RESULTS	EVAL
Establish individual accountability for 5S in HP E,F And K by January 5, 2004	Complete	O
Incorporate 5S responsibilities into quarterly evaluations	Complete	O

- PM associates (Dave and Shane) have been assigned and provided with the 5 S time to perform maintenance on carts and shelves
- Supplies have been color coded to insure that each rack will contain only the items that coordinate with the color on the rack

Associate Feedback

- Associates like specific responsibilities – know where to go
- Observed improvement in activity during Five S time
- Observed improvement in shelf dusting

Evaluation Summary

- Better time management – Five S up to bell
- Significant improvement in cleanliness

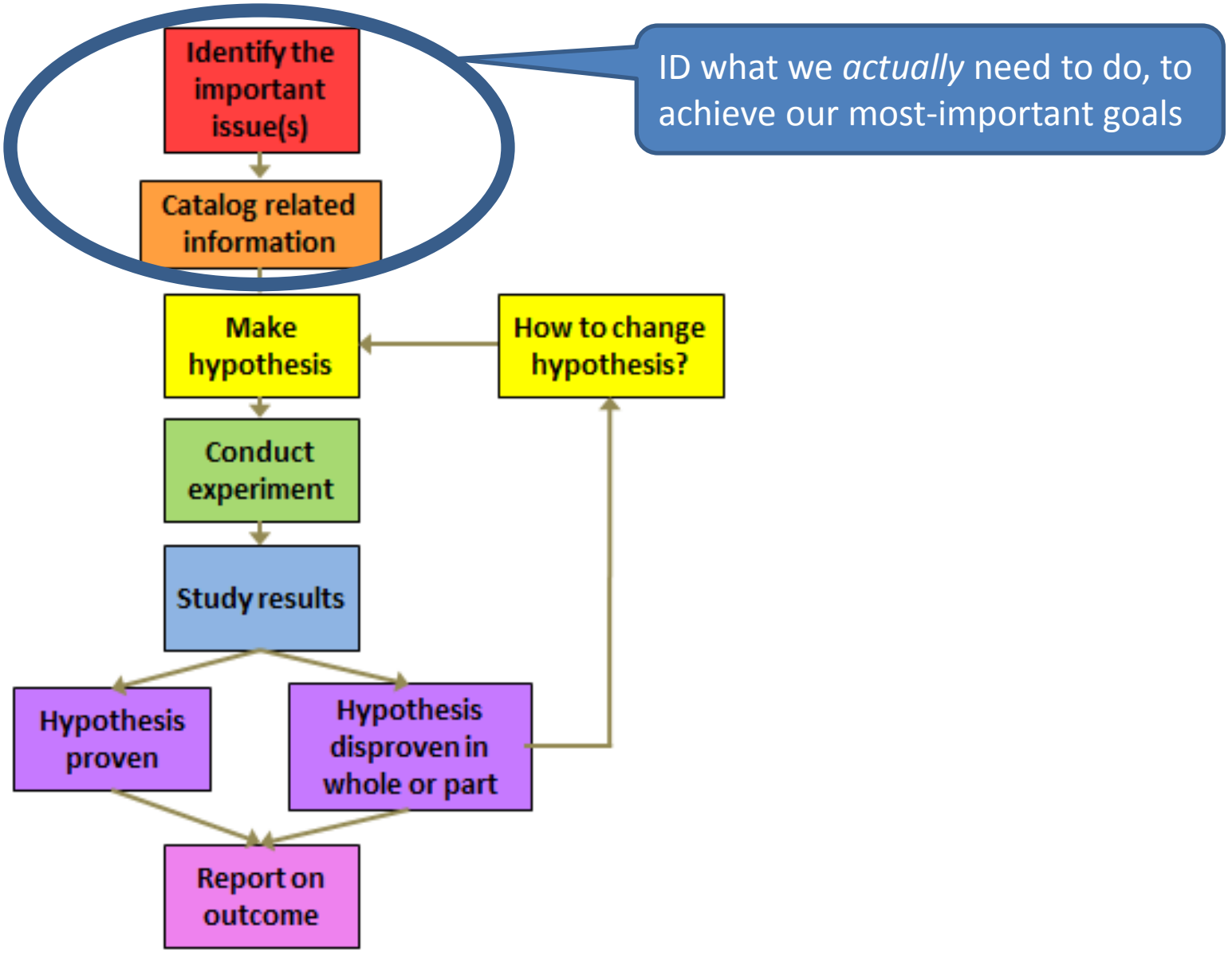
ACT

...E ACTION	RESP	DATE
Continue to evaluate each associate weekly	TL	1/5/04
Develop coverage plan for associates who are out for a extended period of time	Teams	
Monitor 5 S throughout HP	GL/TL	
Revisit Five S evaluation process – determine Roles and Responsibilities between STF and TL/GL	GL/TL	

REFLECTIONS

- Good opportunity to advocate for associates – asked for specific responsibilities
- Good buy in from teams
- Experience as associates increased speed of project – 5 weeks to implementation
- 1st project completed as TLs

The *Complete* Scientific Method



Pre-Hypothesis Research

"**large volumes of…anecdotes, drawings, pictures or other digital forms** are **collected from a subject population**…and tagged **without prior knowledge of purpose**

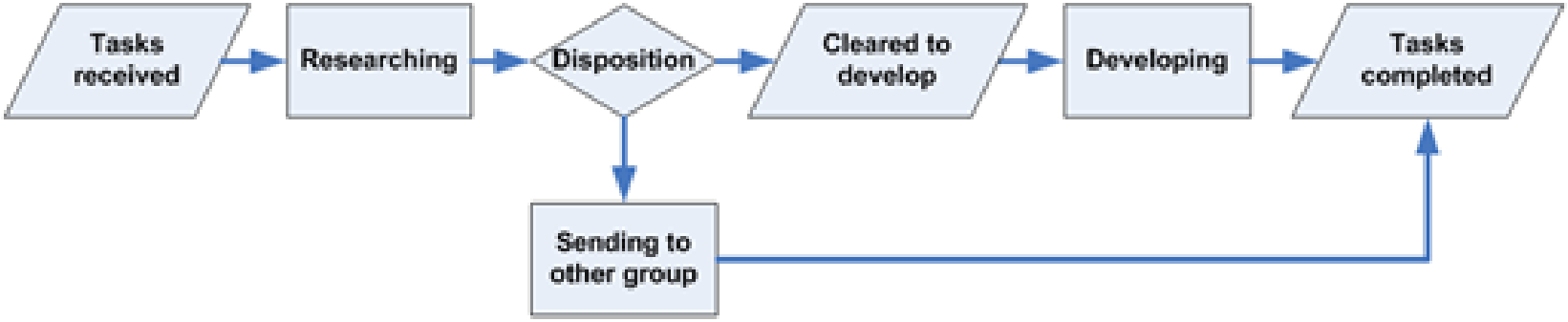
"used to **minimise the danger of expert opinion or bias** which **often corrupts the original data** source [and questionnaires].

"typically **require less than half the investment** often associated with traditional survey techniques.

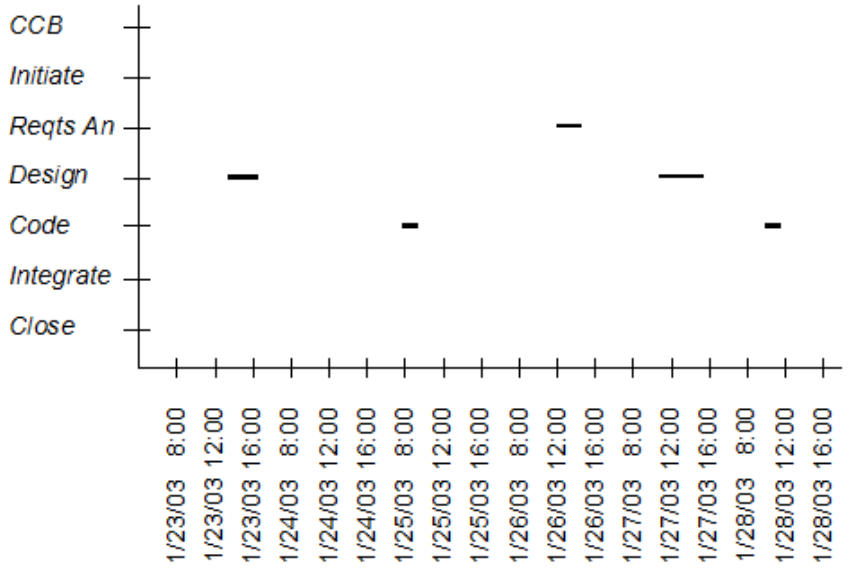
cognitive-edge.com

Lean in software development: Value Stream

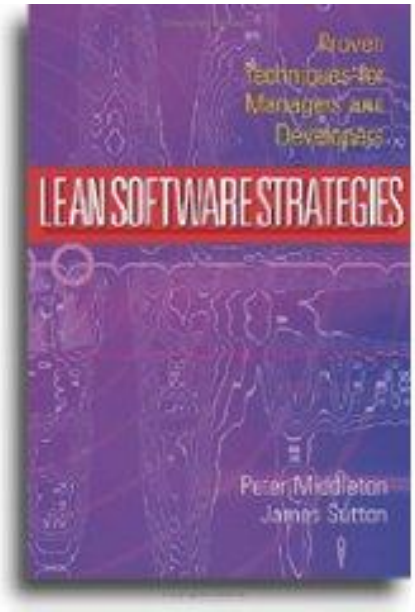
Value-Stream Map



Lean in software development: Flow

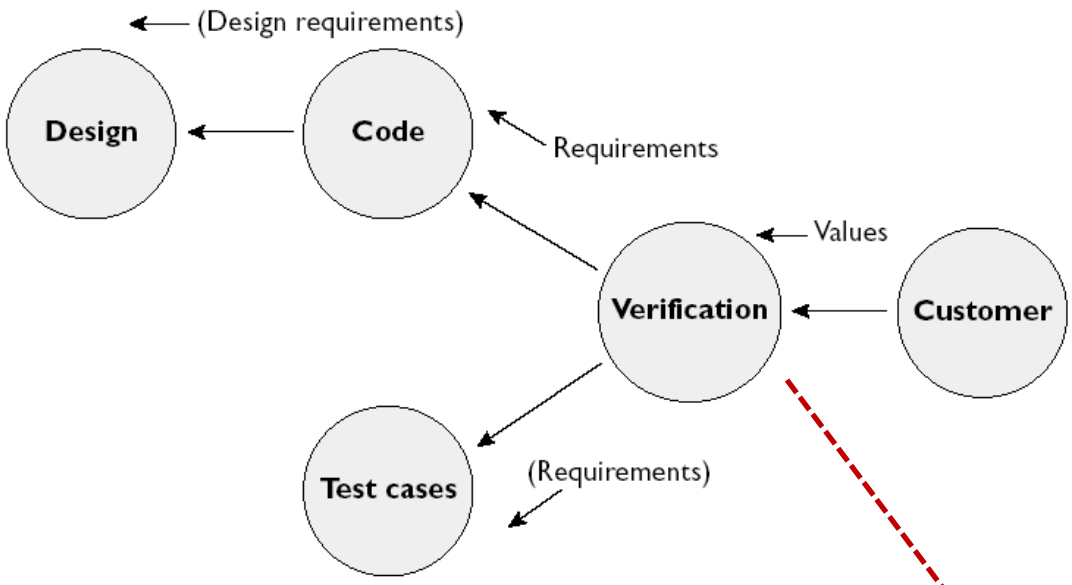


Software DFMA



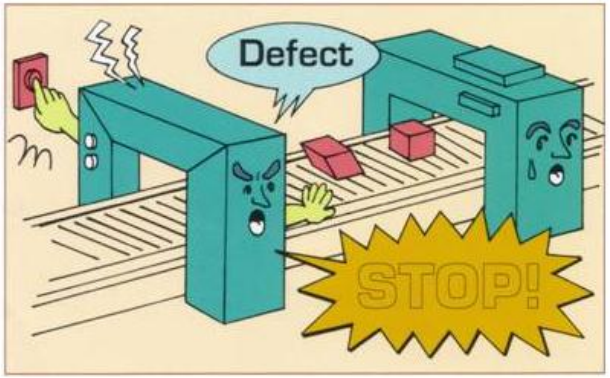
- "Design for Manufacturing and Assembly"
  - Addresses Root Causes of Waste
  - Adaptable to Software
- "Big Parts"
  - Few Classes, Many Instantiations
  - E.g., Using Parnas/Madey Four-Variable Model
  - E.g., Using Parnas [Design] Criteria
    - Requirements-Hiding
    - Hardware-Hiding
    - Decision-Hiding
  - Becomes the Basis for One-Piece Production

Lean in software development: Pull

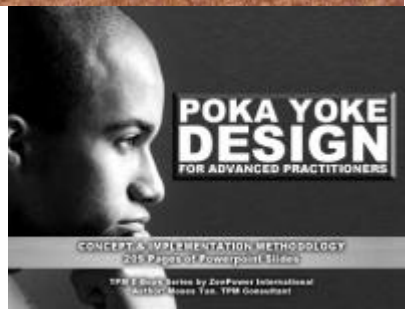


Lean in software development: Perfection

Jidoka (Autonomation)



Poka Yoke (Mistake-Proofing)

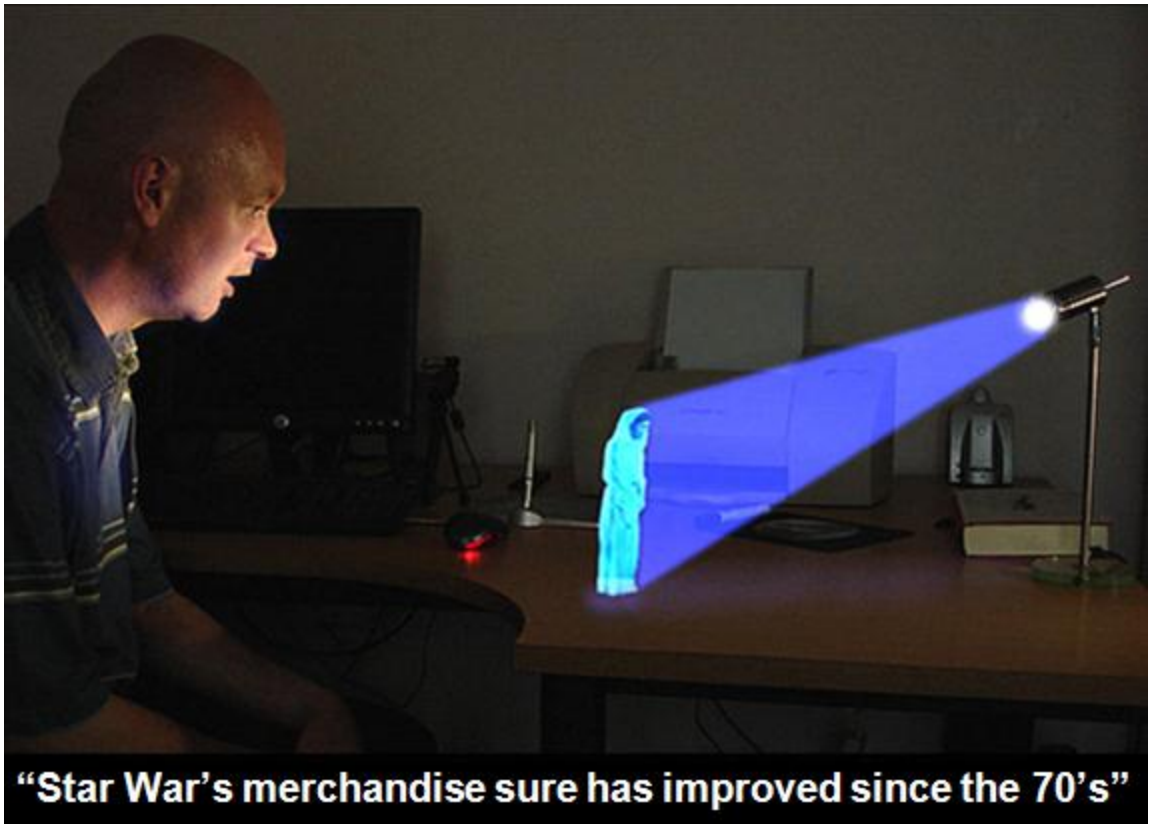


"Lean represents a…shift from focusing on
increasing productivity to focusing on
shortening the time from the beginning of work to the completion
of it."

Al Shalloway
CEO/Founder, Net Objectives Inc.

Two Things Are Needed to Manage Workflow

1) Make Hidden Things Visible and Concrete



2) Limit WIP

For some physical products, flow is readily visible

And …

Even then, some things need help to visualize

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Visual Controls enable managing queues

A classic "kanban"
(Japanese: "billboard"
or "instruction card")

"[Kanban is] based on Lean principle of "pull" – or demand-based replenishment and [product] creation"

www.kanban.com

"Kanban is not an inventory control system. Rather, it is a scheduling system that tells you what to produce, when to produce it, and how much to produce"

Wikipedia

Kanban works with your current process

“change as little as possible

“Resist the temptation to change workflow, roles and responsibilities, and working practices

“It is better to optimize what already exists”

David Anderson, “Kanban”

All too often we equate “free time” with “capacity,” and assume we have the ability to fit in more work. In this case, we are not unlike a freeway.

A freeway can support 0-100% capacity. But when its capacity extends beyond 65%, it begins to slow down.

When it reaches 100% capacity, it stops.

Capacity is a horrible measure of throughput.

Similarly, multitasking is a horrible way to manage your synapses, (and as a recent Stanford study shows, it is likewise ineffective.) If your brain is a highway and you are filling yourself with work, after a while you start to slow down.

Your mental rush hour gets longer and longer. You find yourself struggling to accomplish even the simplest tasks.

That motorcyclist in the picture is that last little 5 minute task you agreed to do.

"It's just five minutes! How could I say no?"

What will workflow/queue mgt do for you?

"The [kanban] system is the foundation for "Leaning" the supply chain throughout the Rexnord business. The integration of [kanban] as a key business process is shortening the lead-time, reducing inventories and has reduced supply chain scheduling. "

Lower planning overhead (less "coordination costs")

Makes work flow quicker

Less work "backed-up"

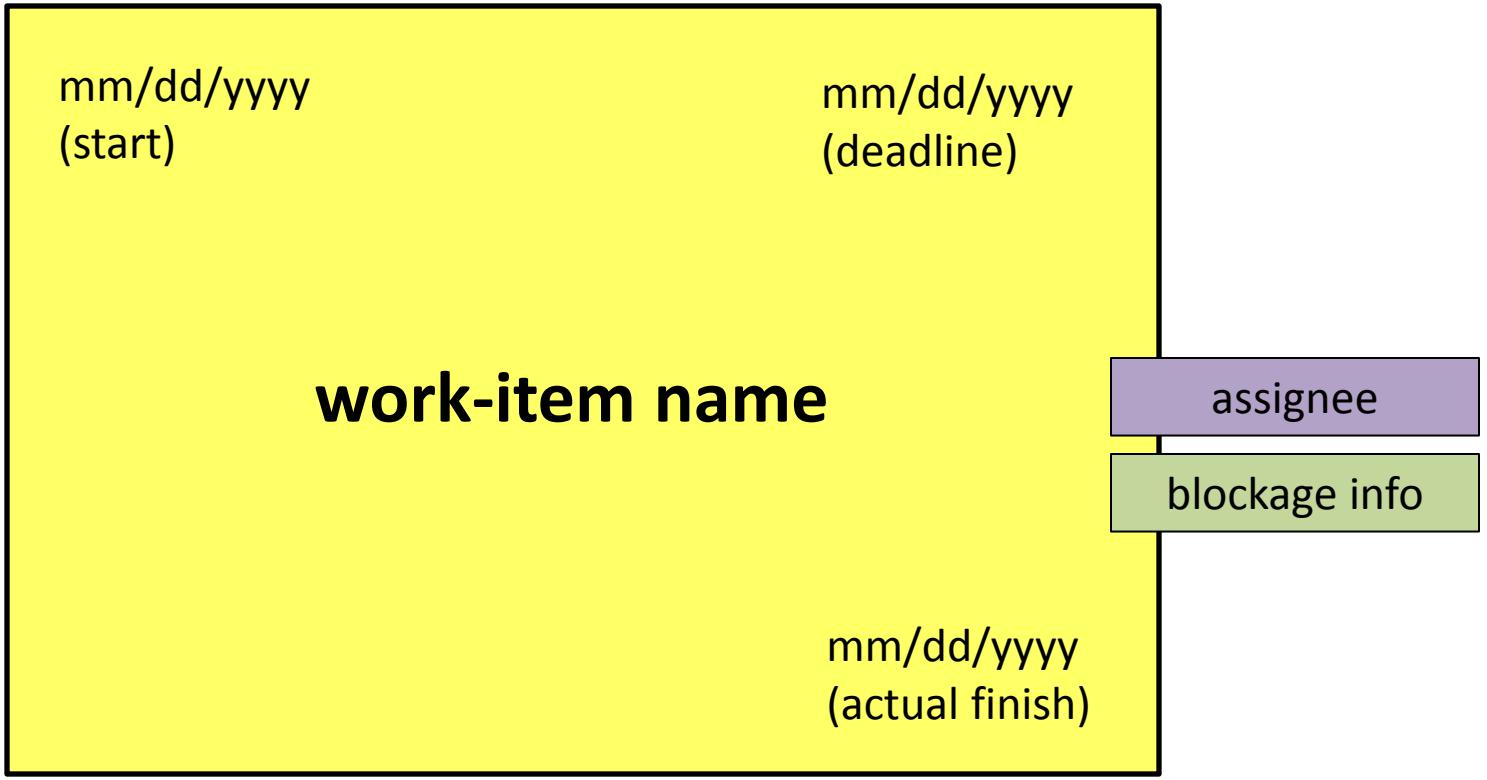
V.P. Operations
Rexnord Corporation

How can we make knowledge-work flow visible?

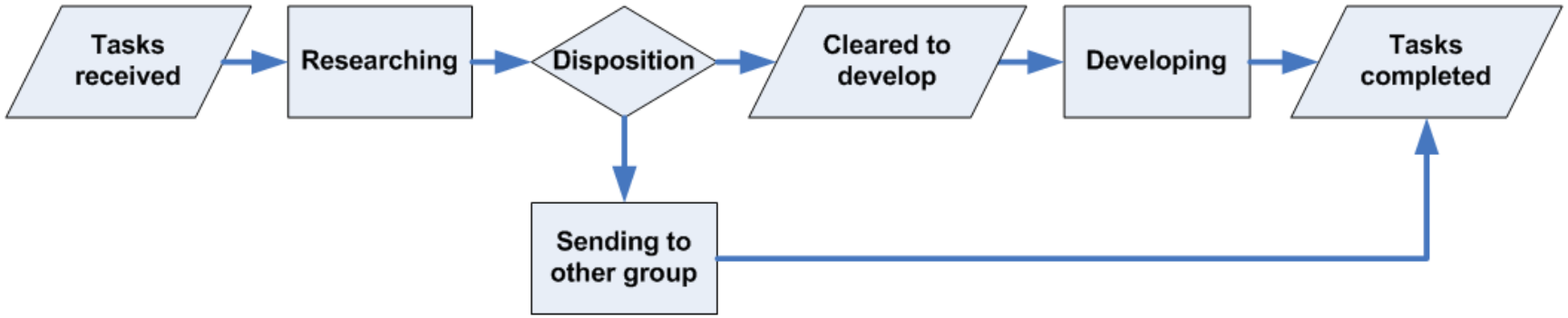
We must depend on constructed visual indicators

The simplest knowledge-work Kanban board

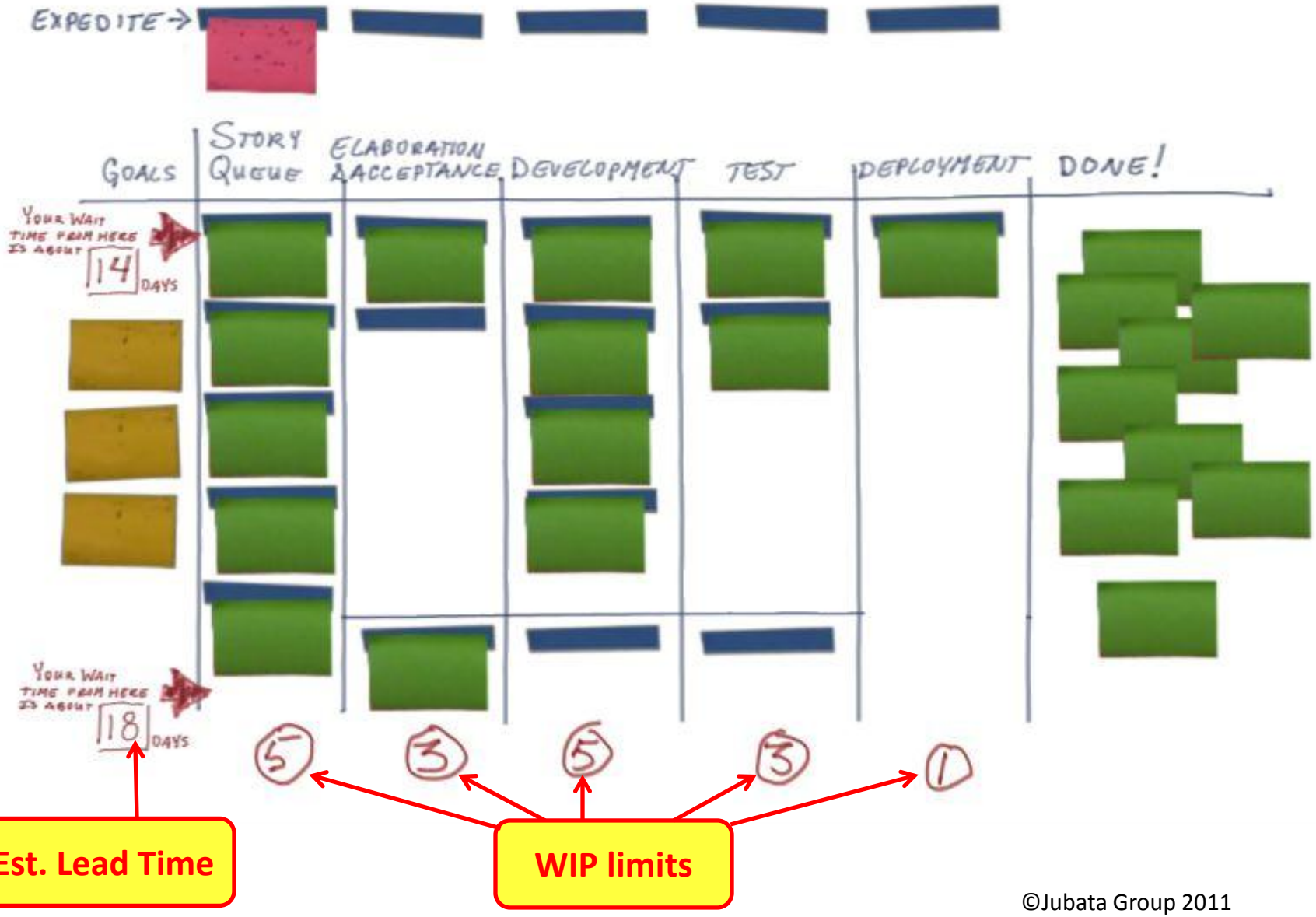
Things on a knowledge-work Kanban card



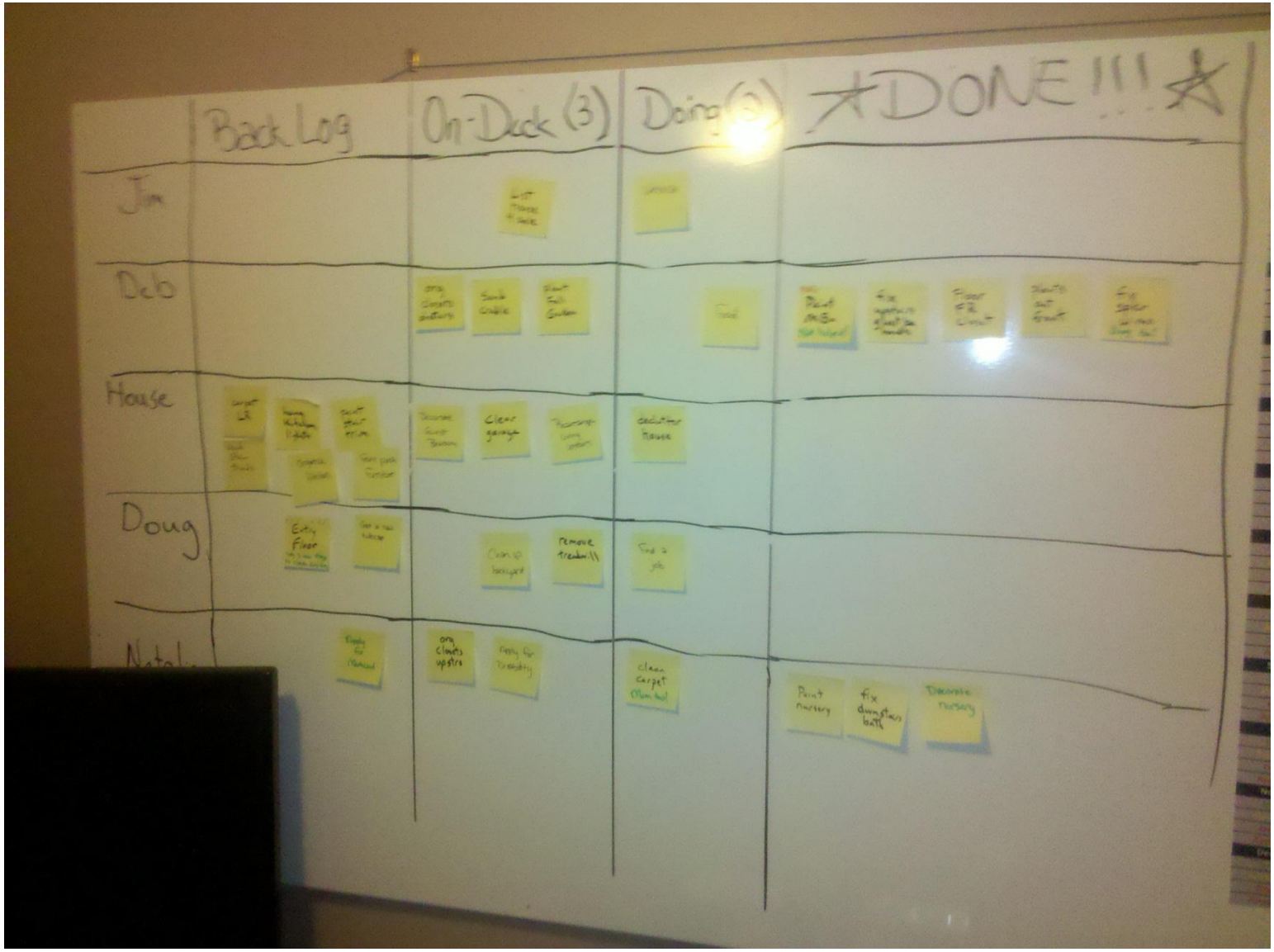
Slightly-More Complicated Kanban



A software-development Kanban board



A personal example



Unexpected Benefits from Kanban

Kanban is Energizing

“Kanban is like a game!”

Director

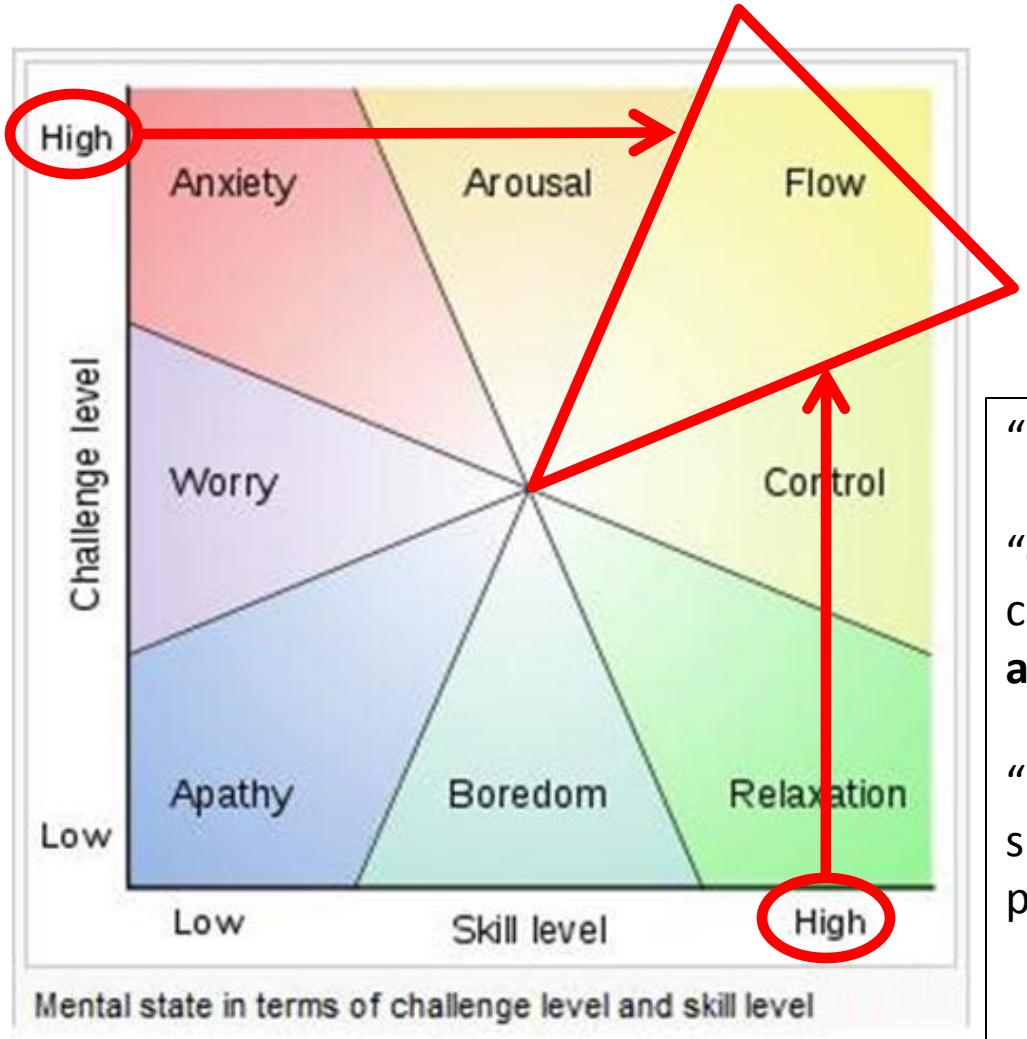
“The more I want to get something done, the less I call it work”

Richard Bach

Kanban builds teamwork

(Board from Agileproductdesign.com)

Kanban facilitates "psychological flow" too



Mental state in terms of challenge level and skill level

You can build a "flow environment"
-Montessori schools (Rathunde & Csikszetnmihalyi (2005), *American Journal of Education* 111 (3): 341–371)

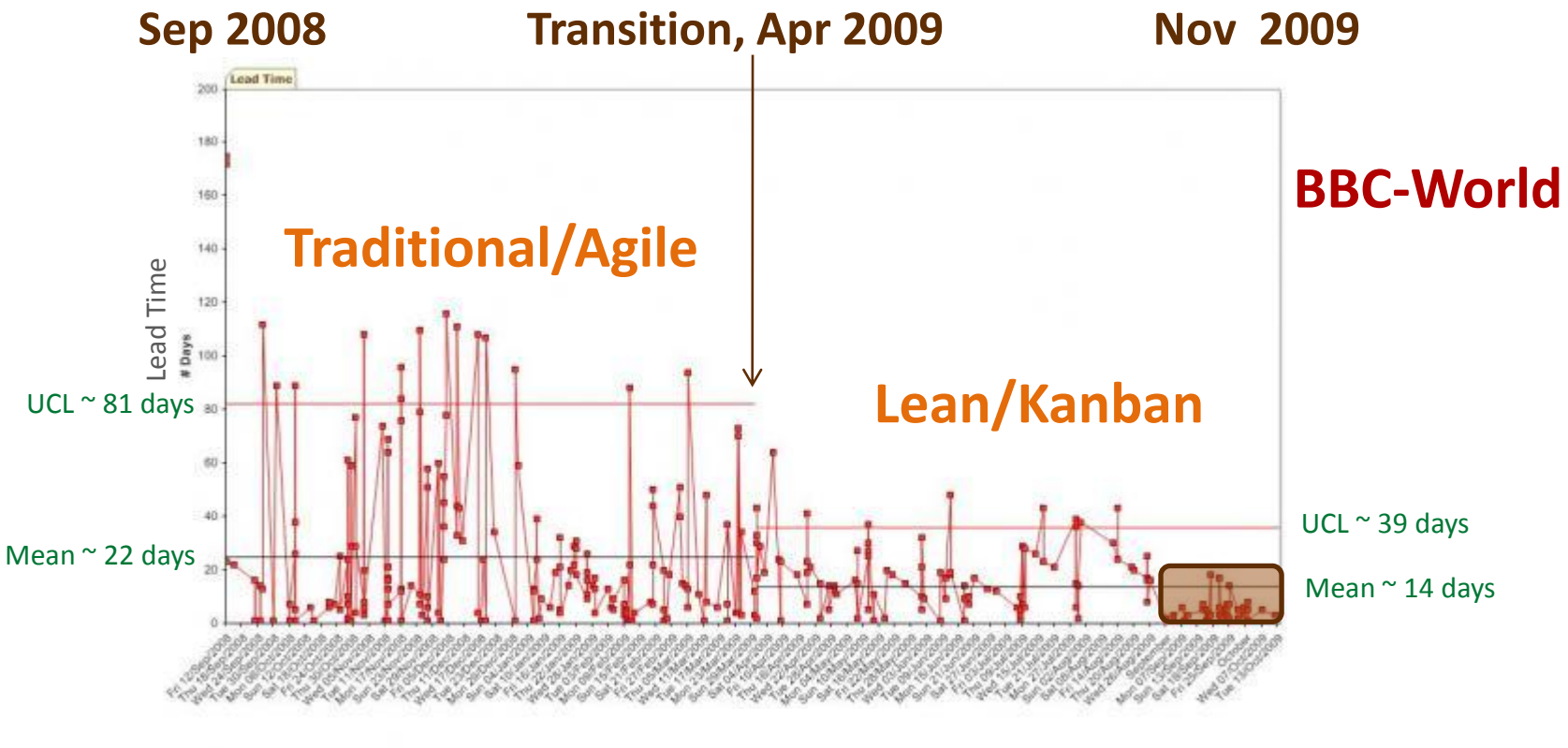
"Flow is **completely focused motivation**

"**emotions** …not just contained and channeled… but **positive, energized, and aligned with the task**

"The hallmark of flow is a feeling of spontaneous joy, even rapture, while performing a task"

Wikipedia article on "flow"

Kanban enables real metrics: lead time



Normal-case deliveries much faster (36% reduction in mean, from 22 days to 14)

Worst-case deliveries improved even more (51% reduction in 2σ, from 81 days to 39)

Cumulative-Flow Diagram

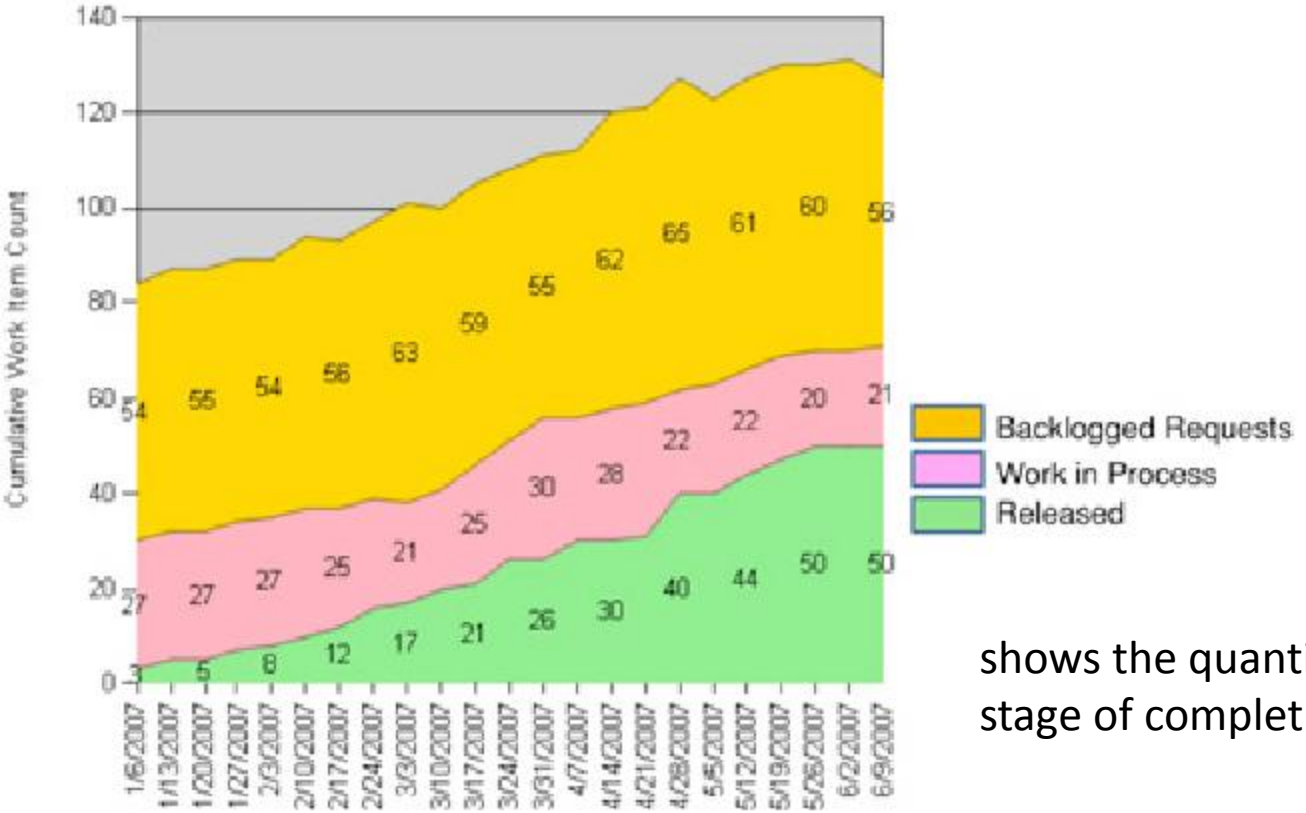
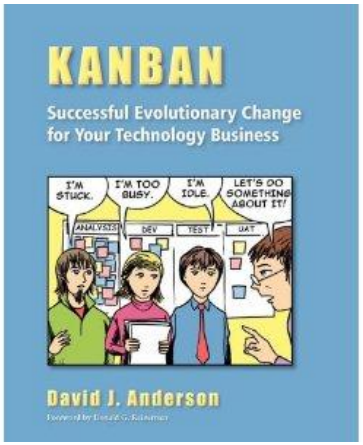
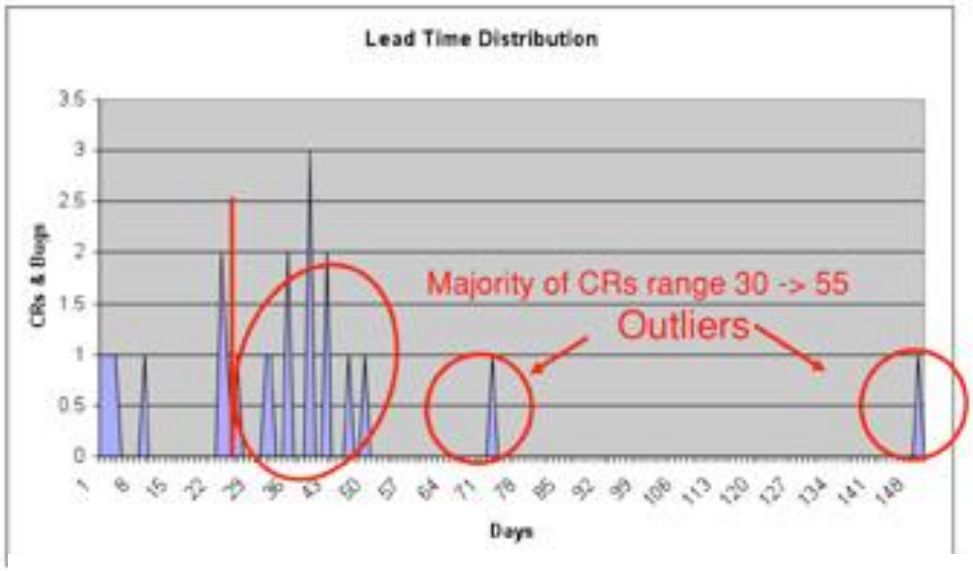


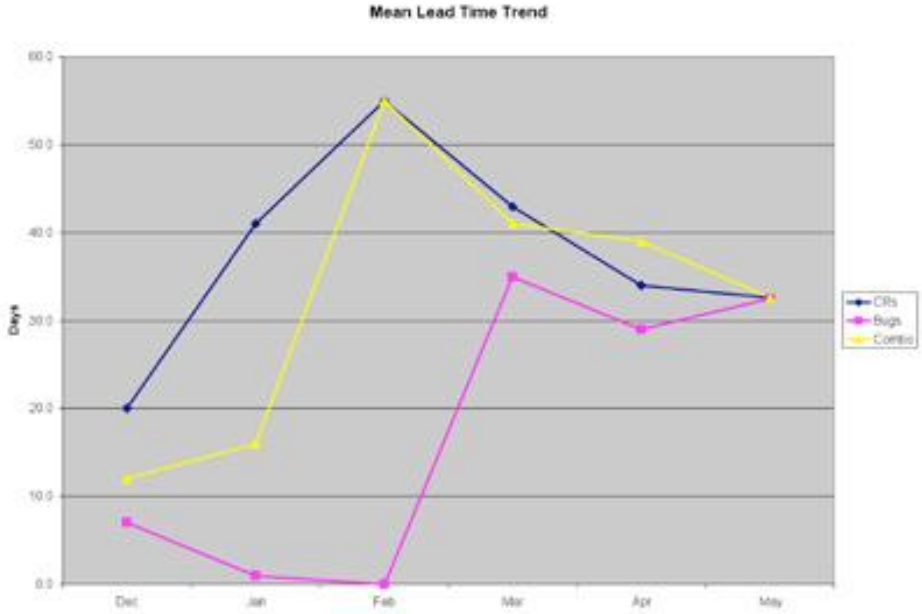
Figure 12.1 Example of Cumulative Flow diagram from a Kanban System



shows the quantities of work at each stage of completion at any date

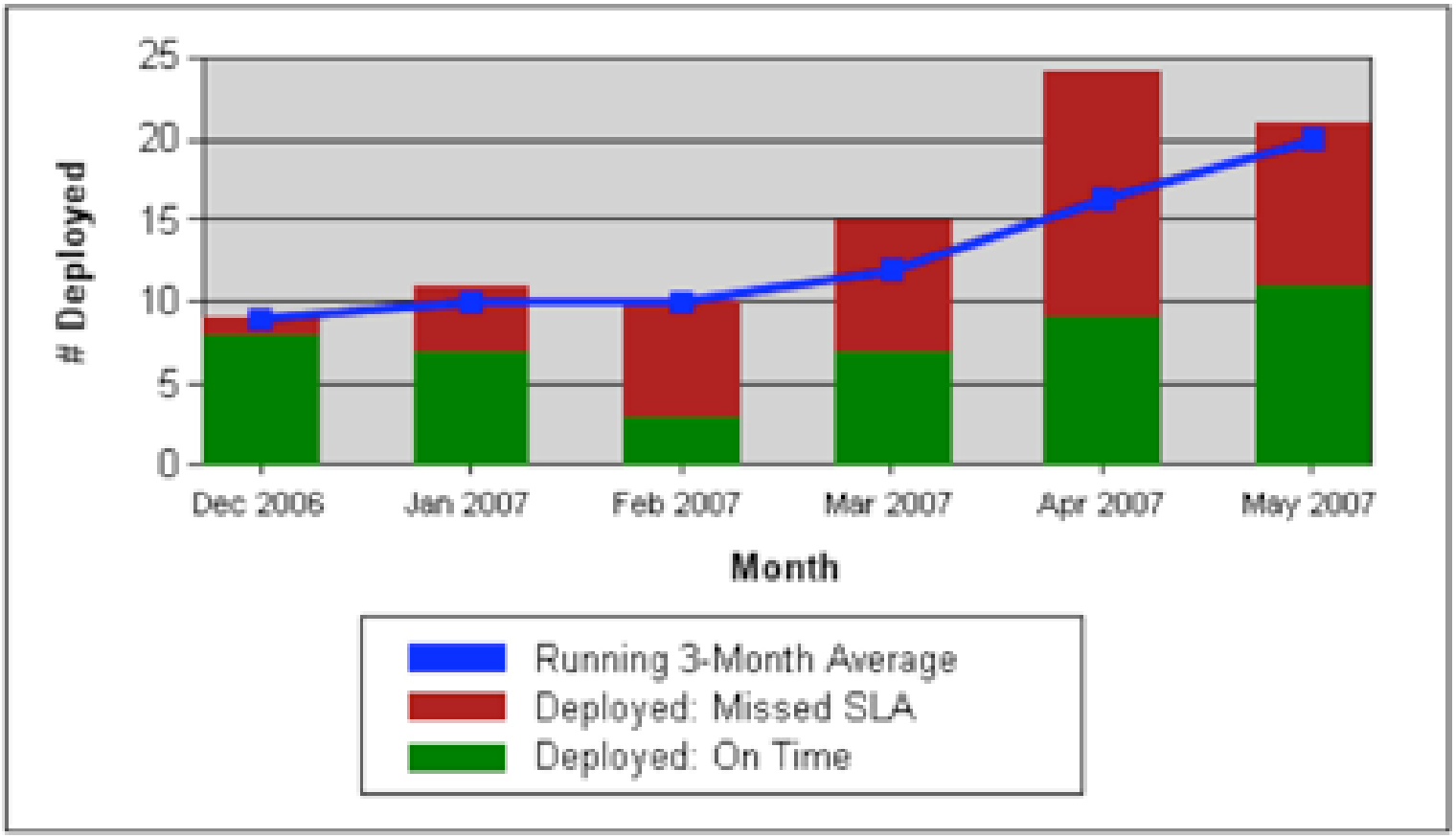
Lead-Time Spectral Analysis (first) and Trending (second)





Throughput

Throughput And Production Rate:

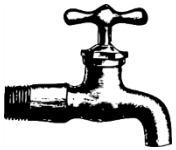


Issues Tracking

Lean: a general paradigm for human productivity

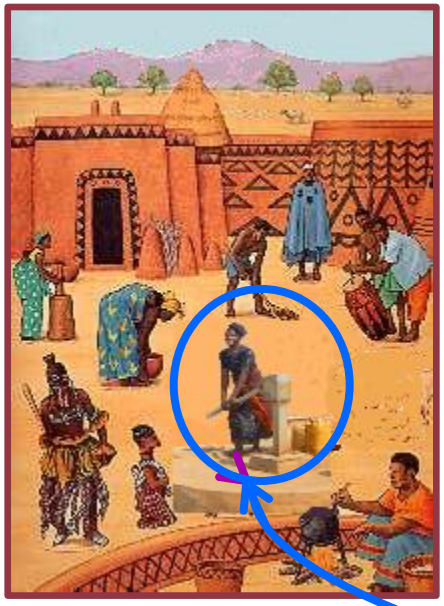
4. Initiate value stream when customer wants the value

Continuous-flow devp



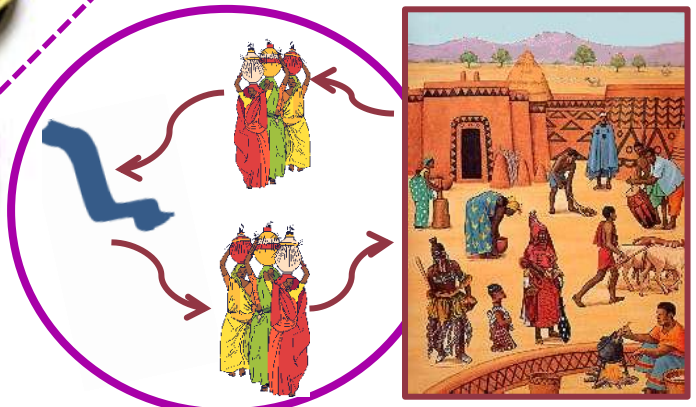
5. Eliminate defects and unwanted additions to the value delivered

3. Tighten and eliminate discon-tinuities in the value stream



1. Identify what the customer really wants or needs

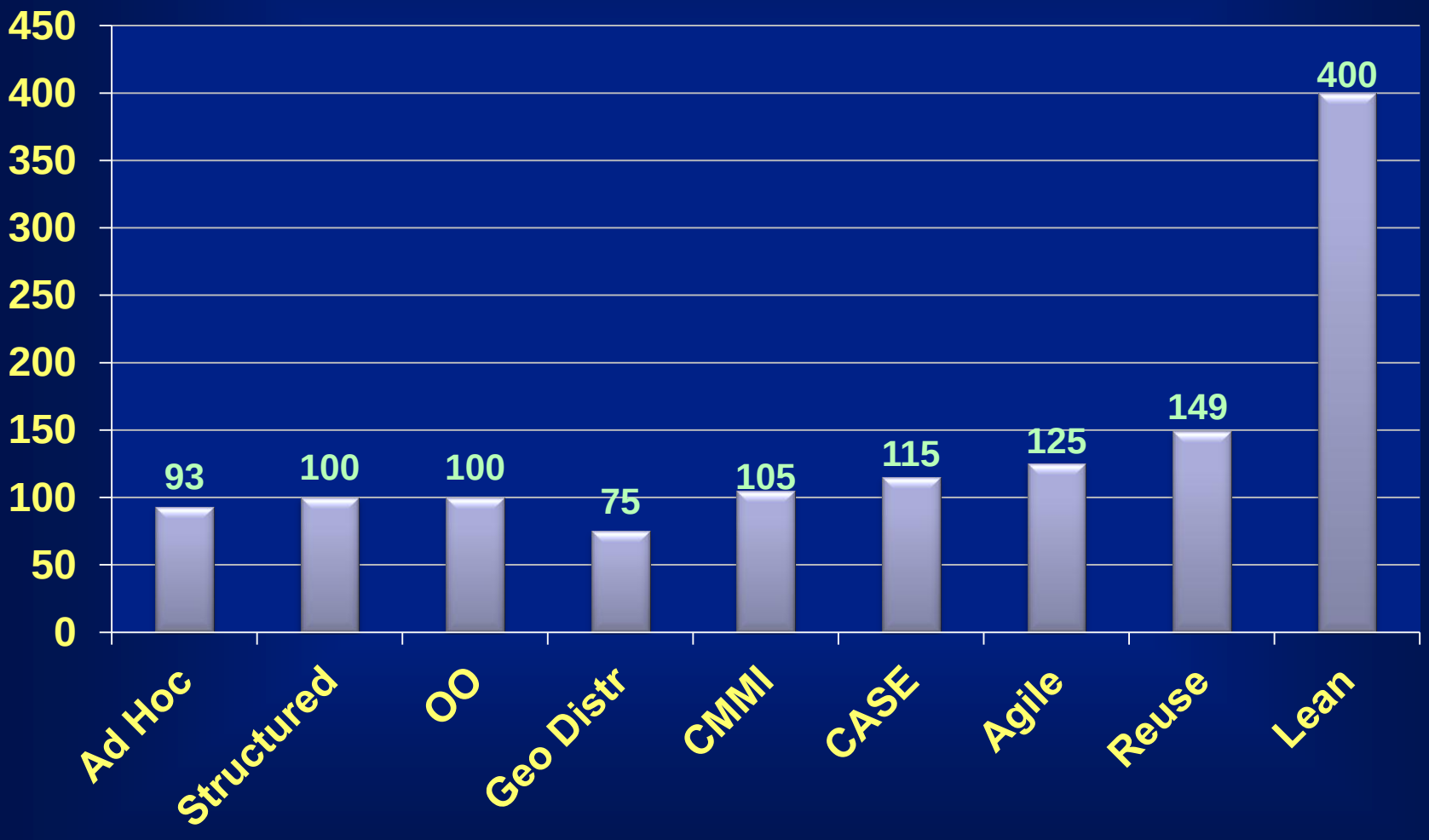
2. Identify what happens to deliver the value to the customer



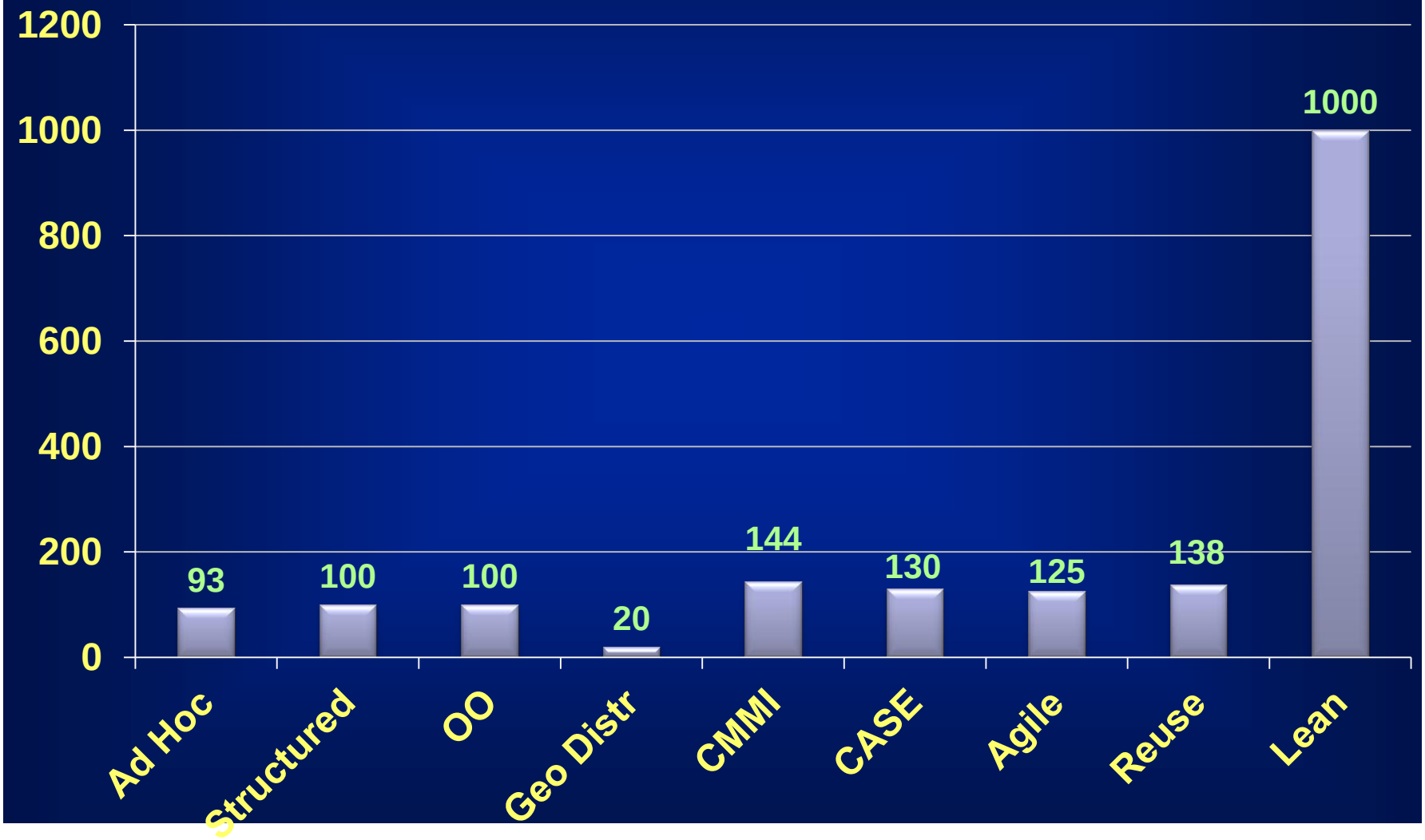
Time-boxed iterative devp

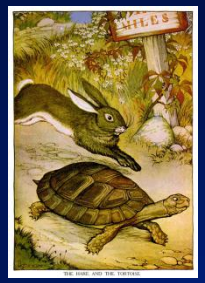
Waterfall devp

S/W Productivity (%)

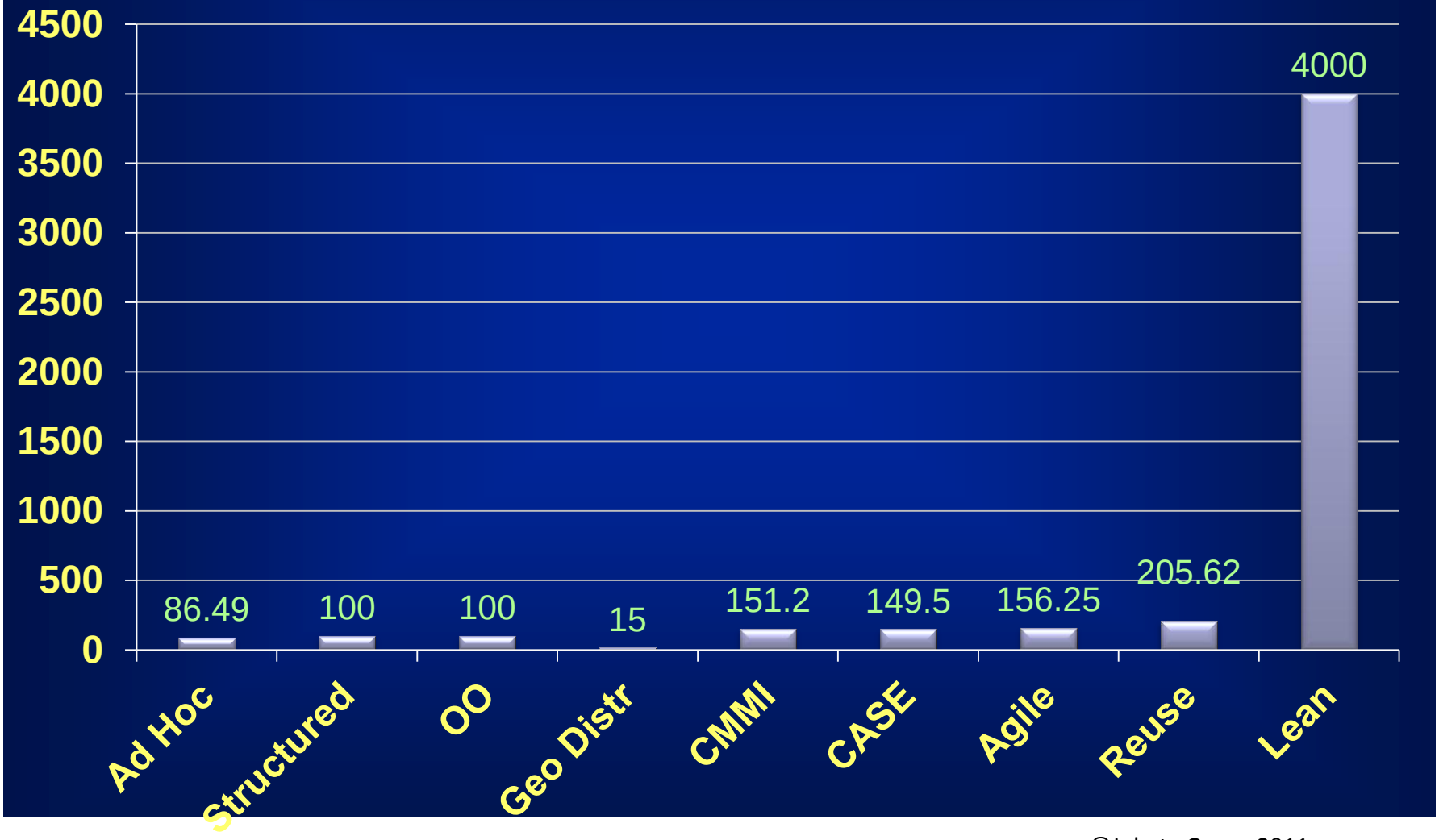


S/W Quality (%)





Productivity WITH Quality (%)



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