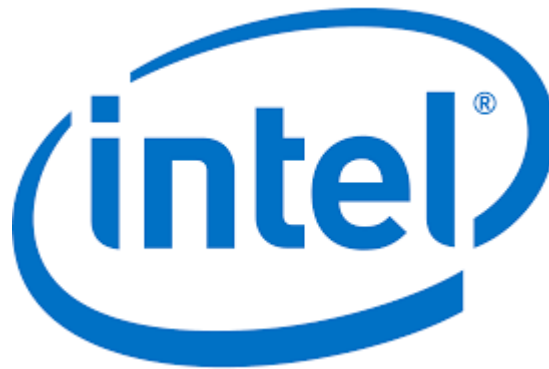




Lean Product Development at Scale

Allen Ringel

Lean/Agile Transformation Leader
Intel





A Bit About Intel

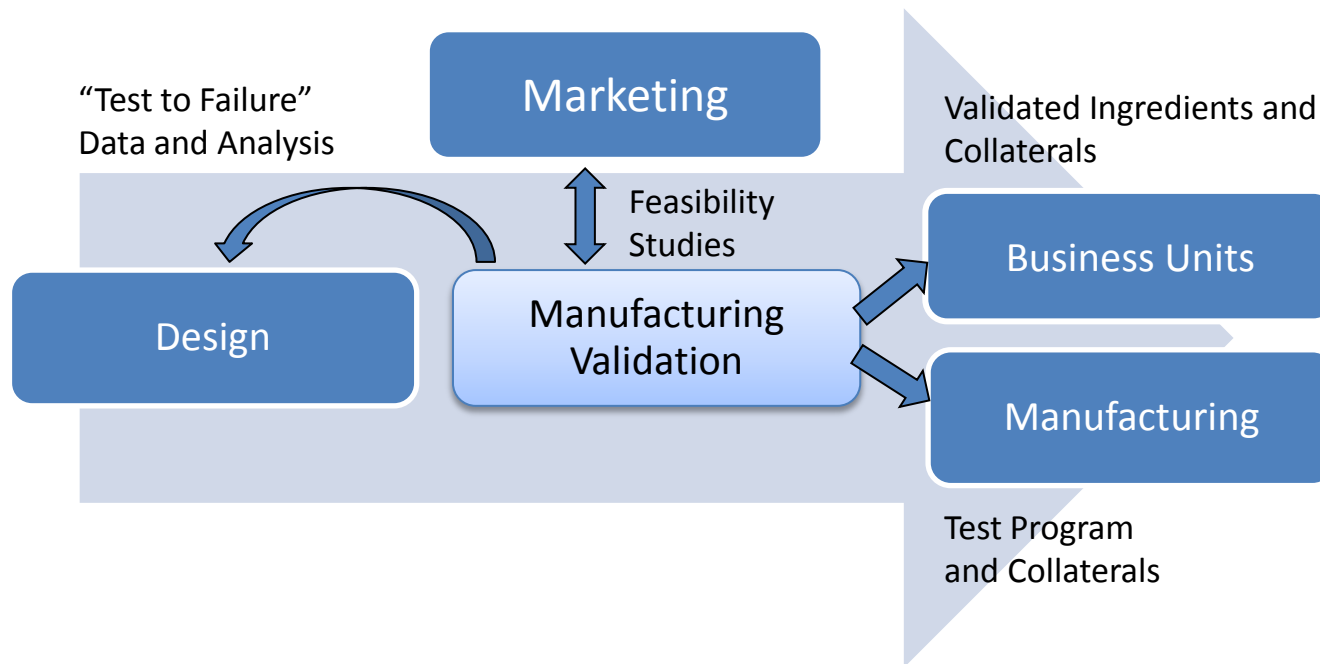


(Embedded video)

- <https://www.youtube.com/watch?v=Jlu16l-D3GM>



Manufacturing Validation Engineering (MVE)





MVE GLOBAL FOOTPRINT





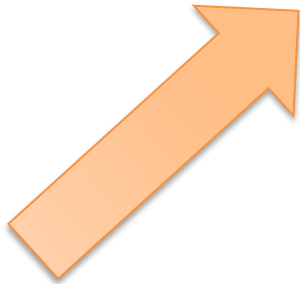
Where We Were in 2005

Delivering Quality Products that Delight Our Customers



Operational Challenges

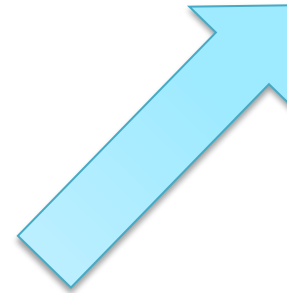
Workload



Quality

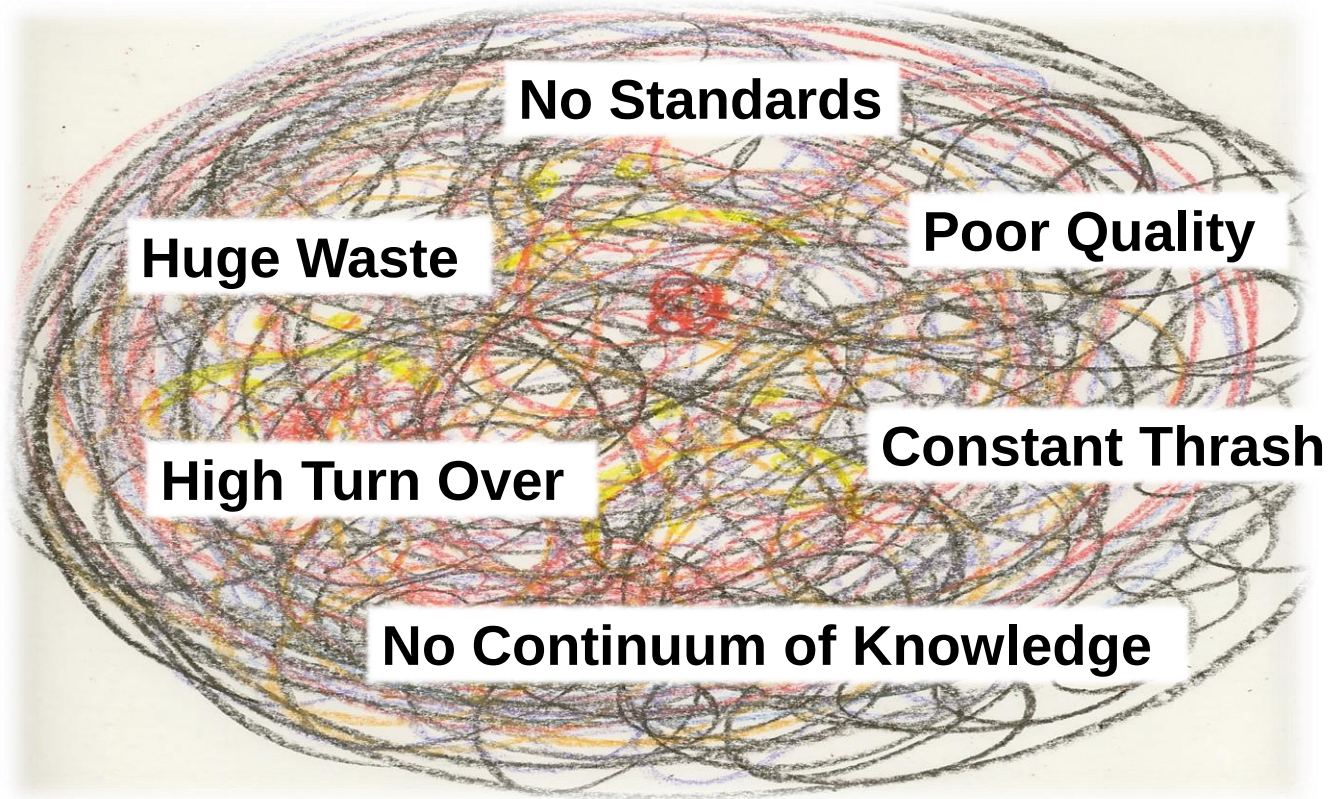


Cost



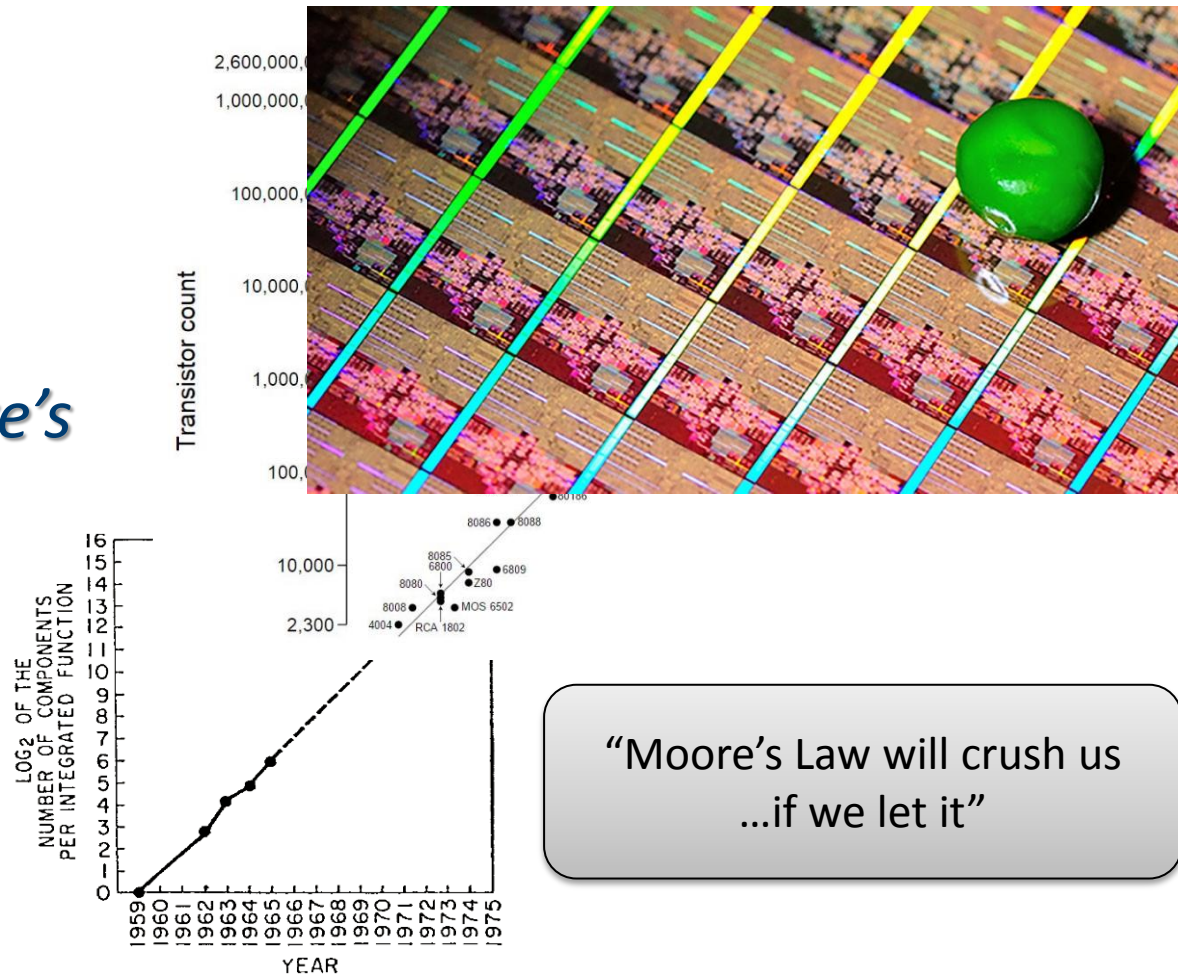


Our Starting Point was a Chaotic Environment





Moore's Law



“Moore’s Law will crush us
...if we let it”

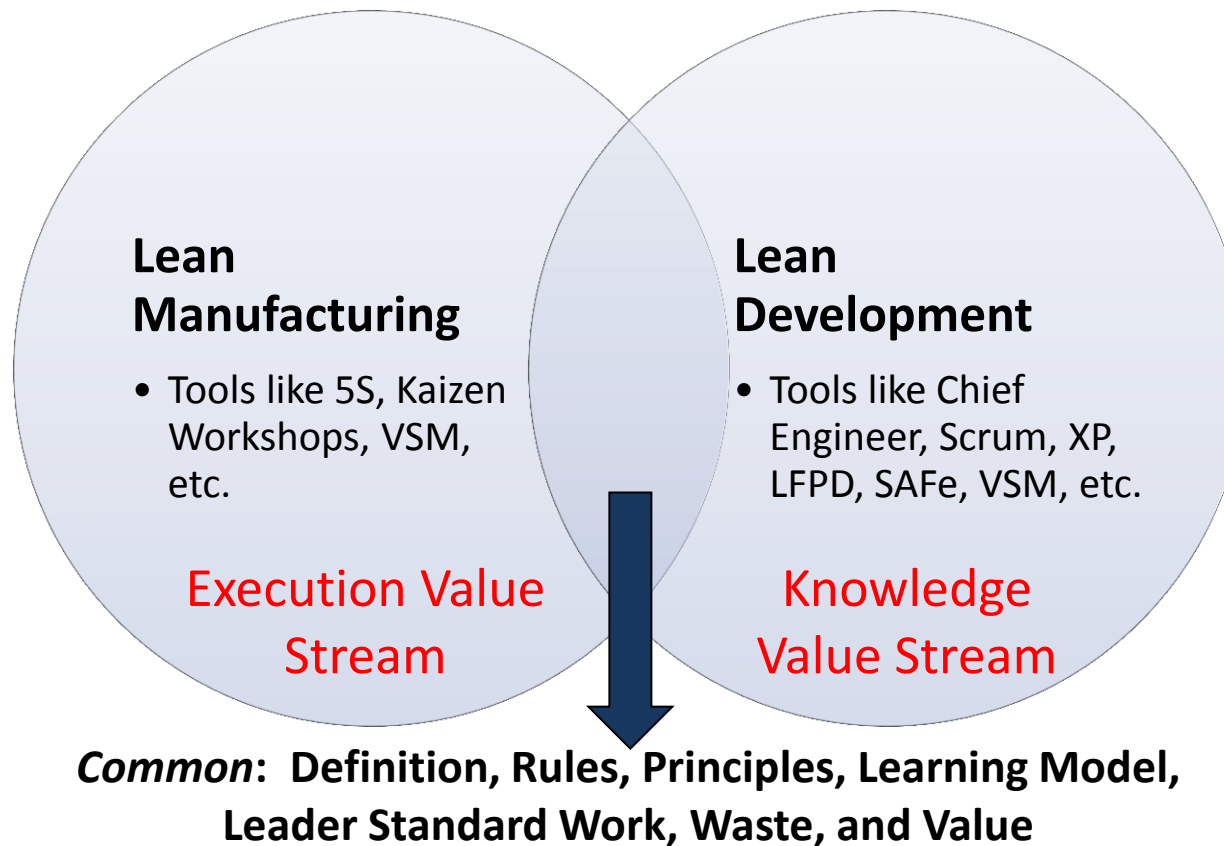


What We Changed

Delivering Quality Products that Delight Our Customers



Lean Manufacturing Development (LMD)





Scrum is MVE's Agile engine for delivering value



Scrum has only 2 principles

- Empirical Process – Replace detailed up-front planning with small, iterative “inspect and adapt” cycles
- Self-Organization – Team self-organizes itself around goals, given constraints



Scrum: Empirical vs. Predictive Approach

Waterfall - Predictive

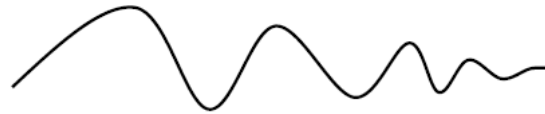
Start with Plan
and all
requirements



End with all
requirements
completed

Scrum - Empirical

Start with a
Project Goal and
some priority
requirements

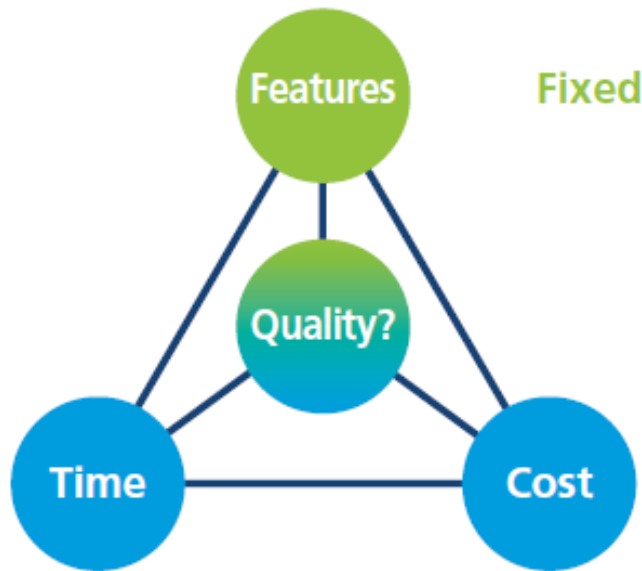


End with
Project Goal
met

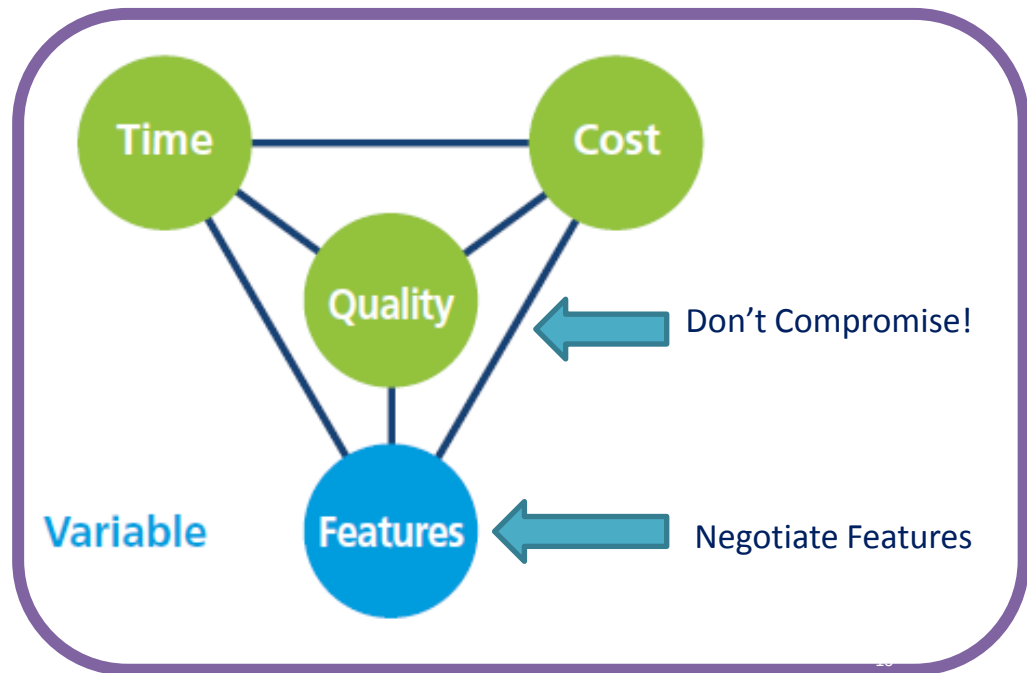


Agile turns the “Iron Triangle” on its head

Traditional Approach

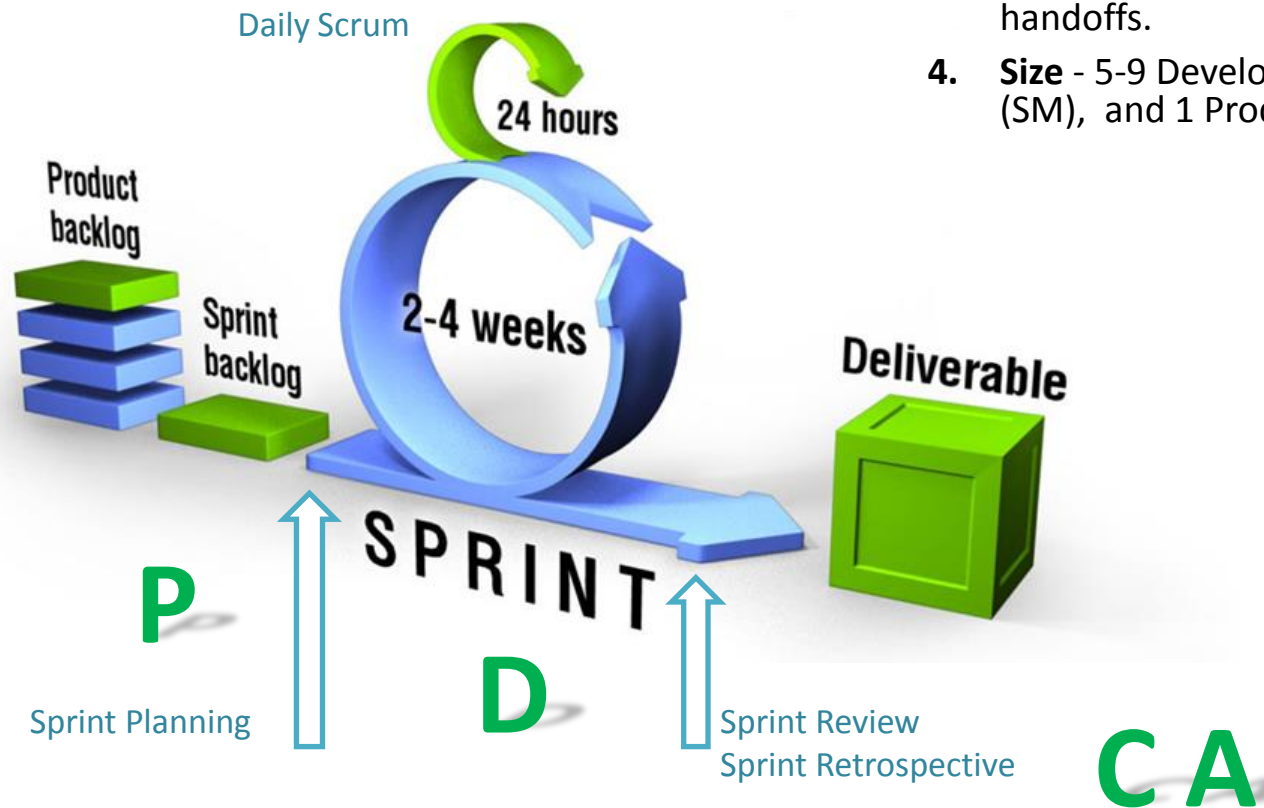


Agile Approach





Scrum Process



Scrum Team Attributes

1. **Co-Location** - Same site, sitting together.
2. **Commitment** - Permanent members, 100% dedicated to Scrum.
3. **X-Functional** - Execute their portion of the value stream, end to end, w/o handoffs.
4. **Size** - 5-9 Developers, 1 Scrum Master (SM), and 1 Product Owner (PO).



Scaled Agile Framework Goals

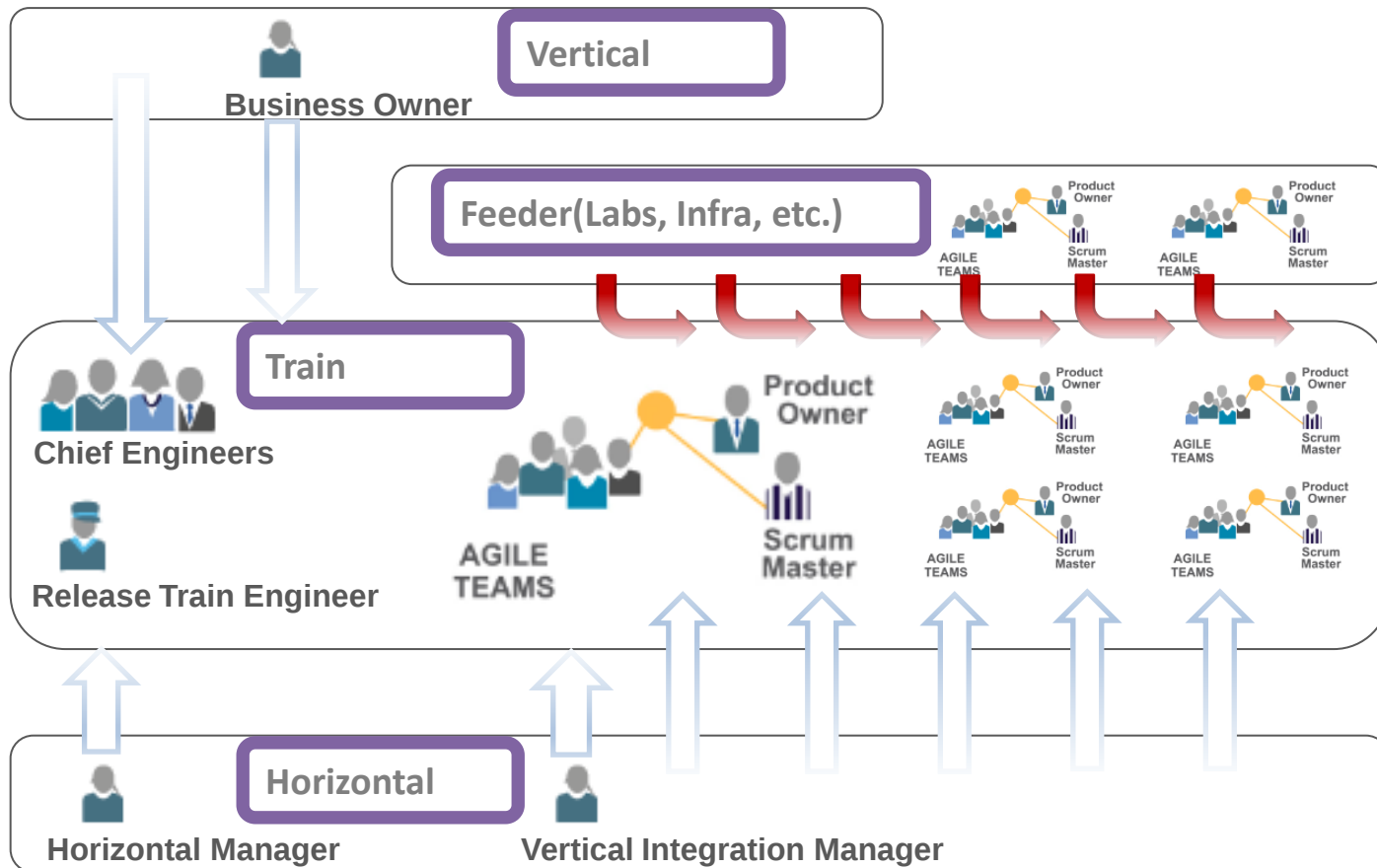
- Code Quality
 - “You can’t scale crappy code.” - Leffingwell
- Execution
 - “Agile Release Trains – self organizing teams of agile teams – reliably and frequently deliver value on demand” - Leffingwell
- Alignment
 - “More value is created by overall alignment than with local excellence” – Reinertsen
- Transparency
 - “Transparency builds confidence, alignment and trust” – Leffingwell

Leffingwell – *Agile Software Requirements*





Clear Structure & Roles for Scaled Agile





A group of people are gathered around a large wall chart, which appears to be a project management or design tool. The chart is covered with numerous yellow and blue sticky notes, organized into a grid-like structure. The people are looking at the chart and discussing it. The chart has several columns and rows, with some cells containing text labels like 'Cache', 'Functional', 'IO_PLL', 'Test Program', 'Structural', 'Reset_PSO_T_1', 'Power_The', 'TM', and 'Yield_Bio'. The people are dressed in casual business attire, including sweaters and button-down shirts. The setting appears to be a collaborative workspace or a meeting room.





And... The Result





Current dashboard...

RELEASE PLANNING COMMIT MATRIX

Release:
Click Mode:
View Mode:

Remove Filters																				
MoSCoW	#	Feature	Product	Planned End	DCD						ACD				SCI			MPV		
All			All		Array - Sierra	Func Module - Sierra	GT Conte...	GT Module - Echo	HTD - Sierra	Scan - Sierra	CLK - Sierra	MIO 1 - Sierra (SoC)	MIO-SIO 2 - Sierra (Client)	PT - Sierra	SIO 1 - Sierra	Fuse - Sierra	TVPV 1 - Sierra (OR BDW BXT)	TVPV 2 - Sierra (OR SKL KBL)	MPV - Sierra	
Undefined	F4416	13. NEW 2+2 P a Prod...	ES TP [WW23]	ww30	6	10	0	0	0	2	2	0	1	3	0	7	0	0	3	
Undefined	F4417	01. NEW 2+2 P a B...	ES TP [WW23]	ww30	4	1	0	0	0	2	3	0	1	0	0	0	0	0	0	
Undefined	F4418	02. NEW 4+3 G L O P...	ES TP [WW29]	ww30	9	29	0	0	0	9	3	0	8	18	0	18	0	0	14	
Undefined	F4419	03. NEW 4+3 G L O P...	ES TP [WW30]	ww30	3	4	0	0	0	1	4	0	5	3	0	4	0	0	0	
Undefined	F4420	10. NEW 4+3 G L O P...	ES TP [WW29]	ww30	3	0	0	0	0	2	1	0	4	13	0	0	0	0	0	
Undefined	F4421	12. NEW 2+3 Prod...	ES TP [WW23]	ww30	4	10	0	0	0	1	2	0	2	20	0	4	0	0	3	
Undefined	F4422	09. NEW 2+3 B O B...	ES TP [WW30]	ww30	4	0	0	0	0	2	2	0	1	3	0	0	0	0	0	
Undefined	F4423	11. NEW 2+3 G L O P...	ES TP [WW23]	ww30	0	1	0	0	0	1	0	0	0	0	0	0	0	0	7	
Undefined	F4426	04. NEW 4+4 M L O B...	ES TP [WW23]	ww23	3	16	2	1	0	2	2	0	11	19	0	7	0	0	6	
Undefined	F4427	08. NEW 2+3 M L O B...	ES TP [WW24]	ww24	9	0	6	0	0	5	4	0	16	12	0	1	0	2	0	
Undefined	F4428	14. NEW 2+3 M L O B...	ES TP [WW29]	ww29	4	0	0	4	0	7	9	0	14	16	0	2	0	0	1	
Undefined	F4429	15. NEW 2+3 M L O B...	ES TP [WW33]	ww33	0	46	0	2	0	10	9	0	6	6	0	13	0	0	0	
Undefined	F4430	19. NEW 4+4 M L O B...	ES TP [WW30]	ww30	5	3	0	0	0	4	4	0	15	17	0	3	0	2	0	

Always visible with real time data

Can easily see normal & abnormal



Largest Scaled Agile deployment ... anywhere

Looking at gross size, Intel is in the top eight of companies coordinating scaled agile. However, other organizations (even with more practitioners) are coordinating smaller release trains

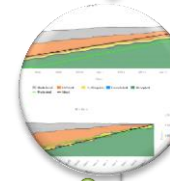
RallyTeam Strategic Account Manager

Intel is far ahead in its level of success and maturity in coordinating a larger number of people. Many other customers are in early stages.

RallyTeam Strategic Account Manager

....Intel's deployment of SAFe is the largest coordinated effort to date

SAFe Creator



And improve upon them



That we can track



Our execution engine has metrics



How we improved...

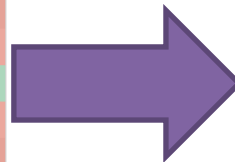
Bullet	Echo	Julio	Light	Longhorn	Rave	Sierra	Total Heads
139	191	125	184	109	182	144	1070
0	7	0	0	6	6	7	26
0	8	0	5	7	7	0	27
0	0	0	9	0	0	0	9
6	9	3	12	13	11	12	66
0	0	0	0	0	6	0	6
0	8	17	15	10	12	0	62
12	10	2	11	6	17	9	66
0	0	0	7	0	0	0	7
9	4	5	9	9	11	10	57
0	0	9	0	0	0	0	9
0	8	0	0	0	0	0	8
7	11	4	11	0	9	9	51
10	7	7	9	9	10	14	66
8	0	11	8	0	5	0	32
5	8	6	7	14	9	15	64
7	4	6	11	0	9	0	37
0	0	0	0	0	9	0	9

Enable Teams to be Efficient

1. Co-Location
2. Commitment
3. X-Functional
4. Size

2014

Train	>90% Ave % Cap	>90% Size	>74% Co-Loc	>98% Commit	>98% No SM
Bullet	93%	100%	87%	87%	100%
Echo	82%	84%	80%	80%	84%
Julio	70%	61%	72%	88%	61%
Light	81%	88%	50%	88%	100%
Longhorn	68%	72%	63%	63%	72%
Rave	75%	81%	59%	68%	90%
Sierra	73%	82%	82%	35%	94%



End of Year 2015 Trend

Train	>90% Size	>78% Co-Loc	>98% Commit	>98% No SM
Bullet	100%	100%	92%	100%
Echo	100%	95%	86%	100%
Julio	91%	93%	88%	100%
Light	100%	100%	100%	100%
Longhorn	100%	87%	100%	100%
Rave	100%	100%	100%	100%
Sierra	100%	100%	100%	100%



Make everything visible!

Normal

Commit Matrix

#	Feature	Product Add Filter	Planned End Add Filter	DCD						ACD			5
				Array - Bullet	Func. Mod. - Bullet	HTD - Bullet	Scam - Bullet	CLR - Bullet	SI - Bullet	SMD 2 - Bullet	SMD 3 - Bullet	SI - Bullet	
13965	[Q315]CHV D1 14 Q5 LPORT a...	CHV	ww40	0	0	0	0	0	0	0	0	0	5
13966	[Q315]CHV D1 BSW PRQ 1F rel...	CHV	ww40	0	4	0	0	0	5	0	1	10	
13967	[Q315]CHV D1 BSW Q5 and 14...	CHV	ww36	0	4	0	0	0	9	0	1	9	
13968	[Q315]CHV D1 Q5 1F Release	CHV	ww40	0	0	0	0	0	0	0	0	7	
13969	[Q315]CHV D1 14 PRQ 1F Release	CHV	ww44	21	2	0	0	0	18	1	2	10	
13969	[Q315]UPS vs static binning ex...	GSD	ww36	0	0	0	0	0	0	0	0	0	
15646	[Q315]SEG1 First AD Post Slic...	CGM	ww36	0	52	7	42	0	18	0	15	4	
15647	[Q315]SEG1 AD Sort and Class...	CGM	ww39	32	36	12	12	0	11	0	19	12	
15648	[Q315]SEG1 Release Two Intic...	CGM	ww43	11	53	3	19	0	12	0	23	3	
15650	[Q315]SEG1 ESI Class Test P...	CGM	ww45	20	69	0	2	0	4	0	7	19	

Data Integrity

	Blocked Stories	0	0	0	0	0	0
	Improperly Used Stories	0	0	0	0	0	0
	Stories in Release without Operation	0	0	0	0	0	0
	Stories in Release without Reason	0	0	0	0	0	0
	Not attached to a feature	0	0	0	0	0	0
	Not attached to a feature	0	0	0	0	0	0
	Other Feature End Date	0	0	0	0	0	0
	Everything is correct: 1/1						

Scrum Rules

9	4	5	9	9	11
0	0	9	0	0	0
0	8	0	0	0	0
7	11	4	11	0	9
10	9	7	9	9	10
8	0	11	8	0	5
5	8	6	7	9	9
7	4	6	11	0	9

Abnormal

#	Feature	Product Add Filter	Planned End Add Filter	DCD						ACD			5
				Array - Sierra	Func. Mod. - Sierra	HTD - Sierra	Scam - Sierra	CLR - Sierra	SI - Sierra	SMD 2 - Sierra	SMD 3 - Sierra	SI - Sierra	
14438	23. SKI-Q315 4-4e N-step Class...	SKL	ww43	2	9	5	5	3	12	8	11		
14438	23. KBL-Q315 4-4e AD Tapein ml...	KBL	ww44	2	9	5	5	3	12	8	11		
15612	2. SKI-Q315 23w K0 Q5 Test pr...	-	-	0	0	0	0	0	12	1	0		
15613	8. SKI-Q315 23w K1 Q5 Prog...	SKL	ww33	8	18	0	0	0	14	2	10		
15614	15. SKI-Q315 23w PRQ Program...	SKL	ww37	4	11	0	8	10	13	7			
15616	15. SKI-Q315 23w CSE Test Prog...	SKL	ww45	5	0	0	0	0	6	5	4		
15617	2. SKI-Q315 23w Q5 T1 Achiev...	SKL	ww33	0	1	0	0	4	3	0			
15618	23. SKI-Q315 44e Q5 T1 Achiev...	SKL	ww45	3	0	0	1	6	7	0			

Blocked Stories: 87/8870	24	0	0	0
Improperly Used Stories: 11/8870	0	0	0	0
Stories in Release without Reason: 18/8870	0	1	0	0
Stories in Release without Operation: 18/8870	3	0	10	4
Not attached to a feature: 11/8870	0	0	0	2
Not attached to a feature: 11/8870	10	0	1	1
Other Feature End Date: 10/8870	10	0	0	1

7	0	0	6	6	7
8	0	5	7	7	0
9	0	9	0	0	0
9	3	12	13	11	12
0	0	0	0	6	0
8	17	15	10	12	0
10	2	11	6	17	9



Results & Significant Impacts

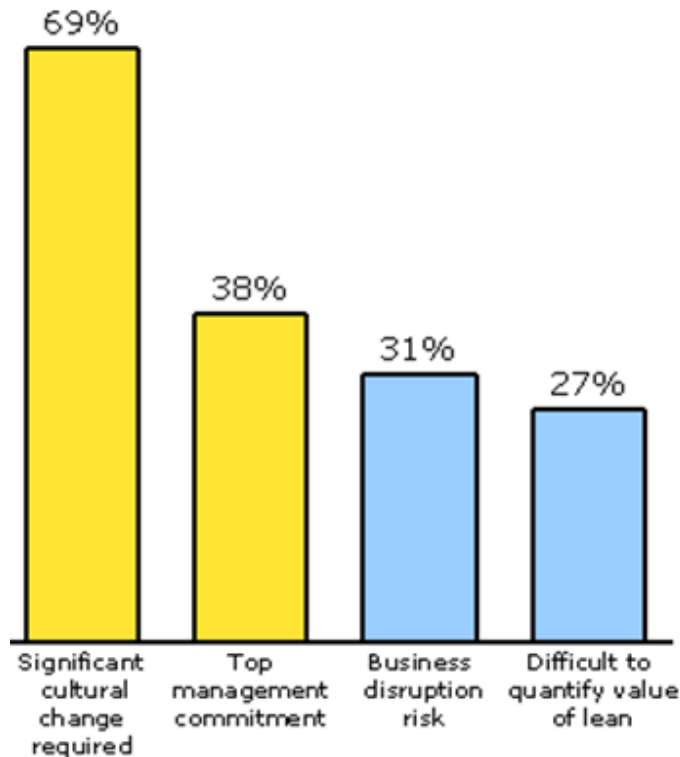
- **Reduced Cycle Time**
 - Scrum and modern tools enabled a 66% reduction in Test Program lead time
- **Strong Performance to Schedule - Discipline**
 - Capacity-based planning and cadence for has eliminated schedule slips for the past 3 years
 - Customers and upper management are changing their behaviors to protect the cadence
- **Improved Morale**
 - Improved communication and job satisfaction
 - Big jumps in the annual Org Health Survey
 - Burn-Out based Retention Problem substantially eliminated – Sustainable Pace
- **Increased Transparency & Visibility**
 - Found bugs, impediments, weak tools, poor engineering habits
- **Institutionalized Process**
 - Teams demanded adherence when the environment becomes chaotic
- **Cross Intel Impact**
 - 2500+ SW/HW Engineers across Intel trained and using our Agile and Lean processes



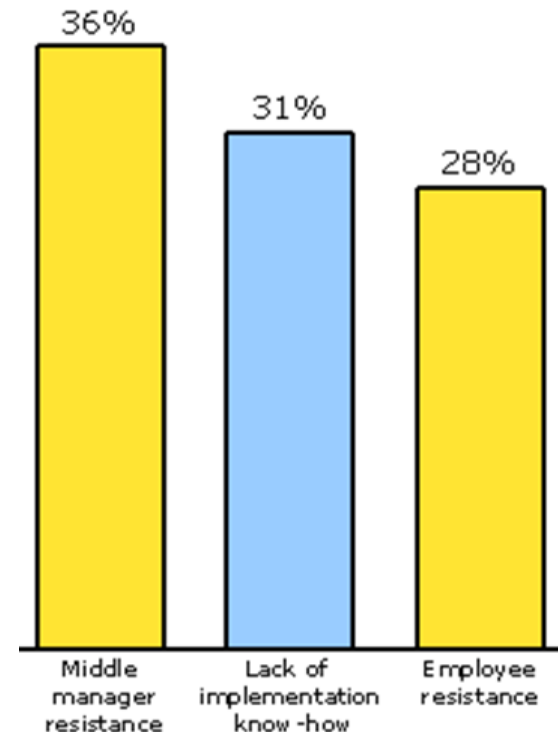


Executive Sponsorship is Critical

Primary barriers to lean initiative adoption



Primary barriers to lean program implementation



Source: [Lean Enterprise Institute 2007 Survey](#); [Lean Strategies Benchmark Report 2004, The Aberdeen Group](#)



Systemic Barriers to Innovation

- Variation Kills Innovation
 - Some teams getting better results than others
- Overburden Kills Innovation
 - Product roadmaps ungoverned by organizational capacity become exercises in survival
- Accommodation Kills Innovation
 - A wasteful systems create firefighters, not scientists
- Innovation requires capacity - Waste, Variation and Overburden consume it
 - Lean is a powerful enabler for innovation





The Wastes

- Over Production – Extra Features
 - Over-designing, unnecessary complexity, gold Plating
- Inventory - Partially Done Work
 - WIP, Long Feedback Cycles
- Over Processing – Re-Learning
 - Wishful Thinking, Scatter, Lost Knowledge
- Motion – Task Switching
 - Un-prioritized Work, Too Many Meetings, No time to “Focus”
- Waiting
 - Delays, Red Tape, Queues
- Transportation - Handoffs
 - Separating Responsibility, Knowledge, Action and Feedback
- Defects
 - Bugs, Rework, Detecting instead of Preventing
- Variation
 - Unevenness in the arrival and execution of work
- Overburden
 - Loading of people, systems, and equipment beyond capacity

From Poppendieck - *Implementing Lean Software Development*





A “Green Eggs and Ham”

Problem

Would you?
Could you?
In a car?

*You do not like them.
So you say.
Try them! Try them!
And you may
Try them*

Eat them.
Eat them.
Here.

I would not
could
in

Are you clinging to what is comfortable and known?
What might you be missing?

Green Eggs and Ham
By Dr. Seuss

Dr. Seuss – Green Eggs and Ham



People need
guidance...



Thank You!

Your opinion is important to us!

Please take a moment to complete the survey using the conference mobile app.

Session: TP/03

Lean Product Development at Scale

Allen Ringel

Intel

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