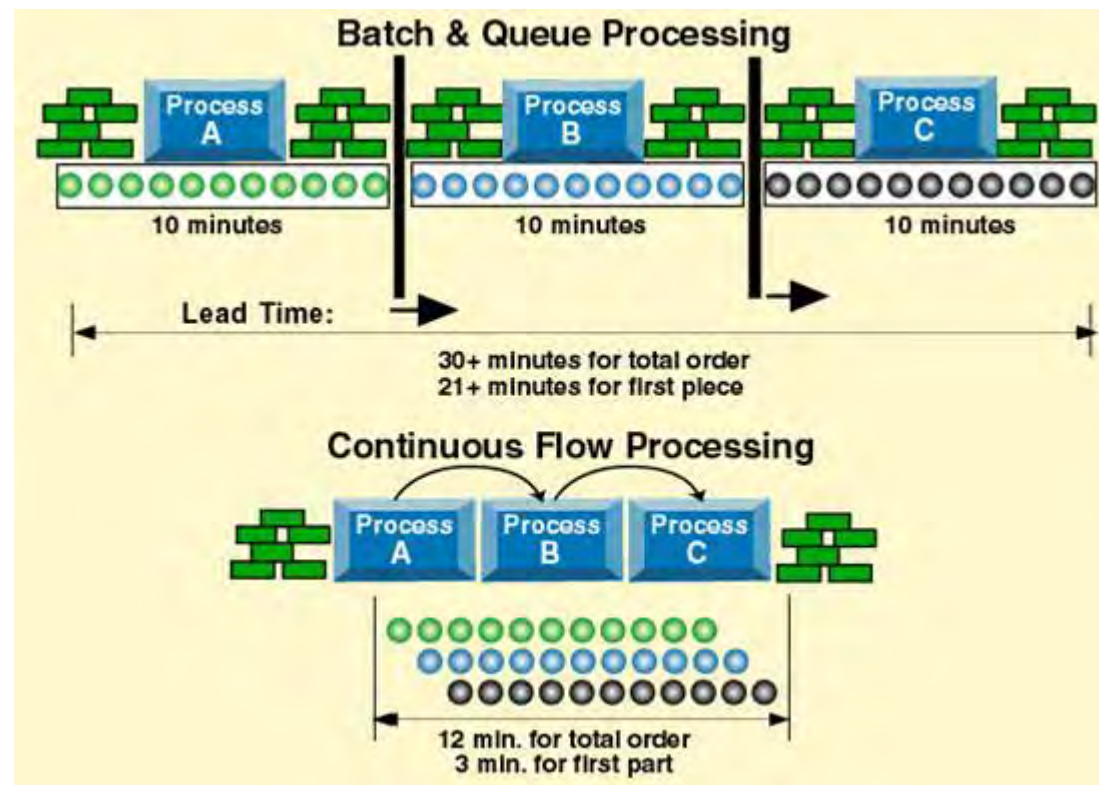


Flow & Batch Size

The best batch size is one piece flow, or make one and move one!



*Slide courtesy of NHMEP

Creating Flow

- Keep the process flowing.



POUS (Point of use tool storage)



5S

Deciding Locations

POUS

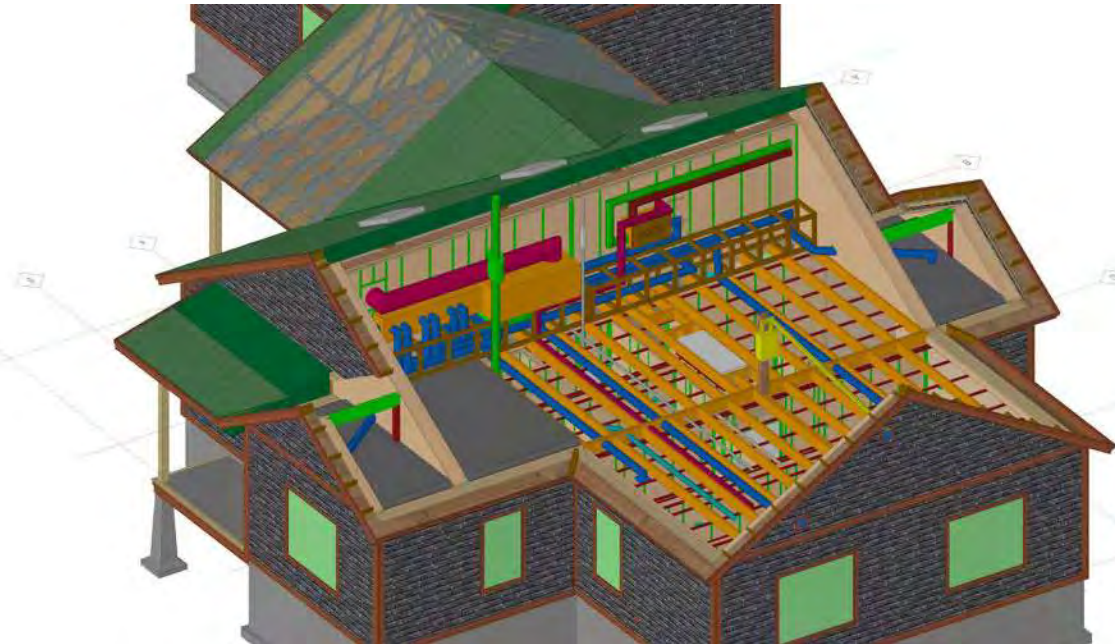
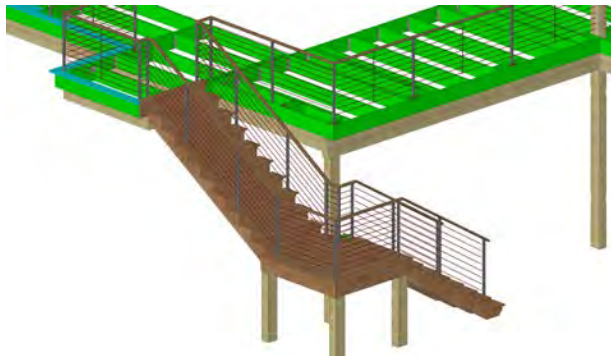


KANBAN

(Pull Systems Min Max and Automatic Triggers)



Getting it right the first time



BIM is a critical part

-“Measure twice cut once”

-Build it twice, construct it once

KAIZEN

Flat Organizational Culture



Getting Better at Getting Better, Part III:

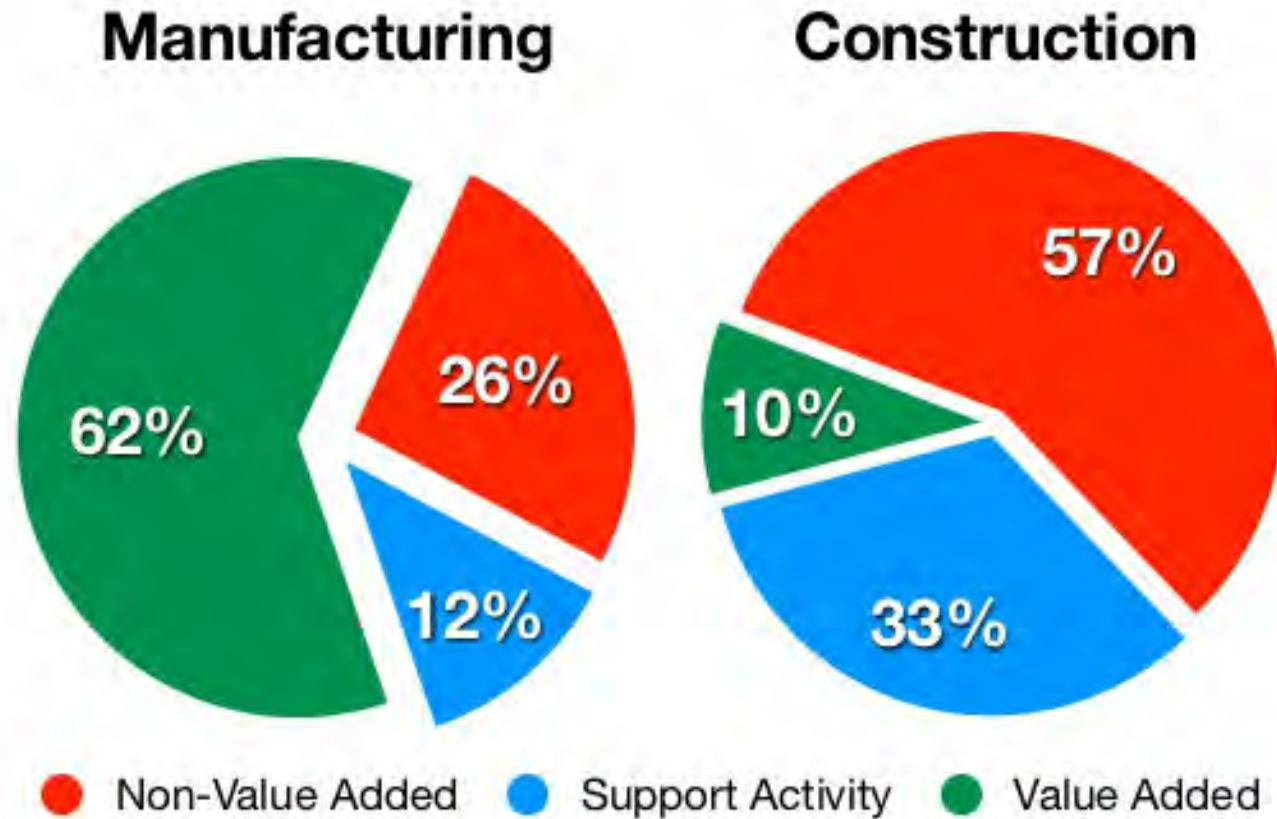
Lean Thinking On Site and In the Office

NESEA Building Energy Boston 2017

ANDREW DEY,
Operations Director, Unity Homes

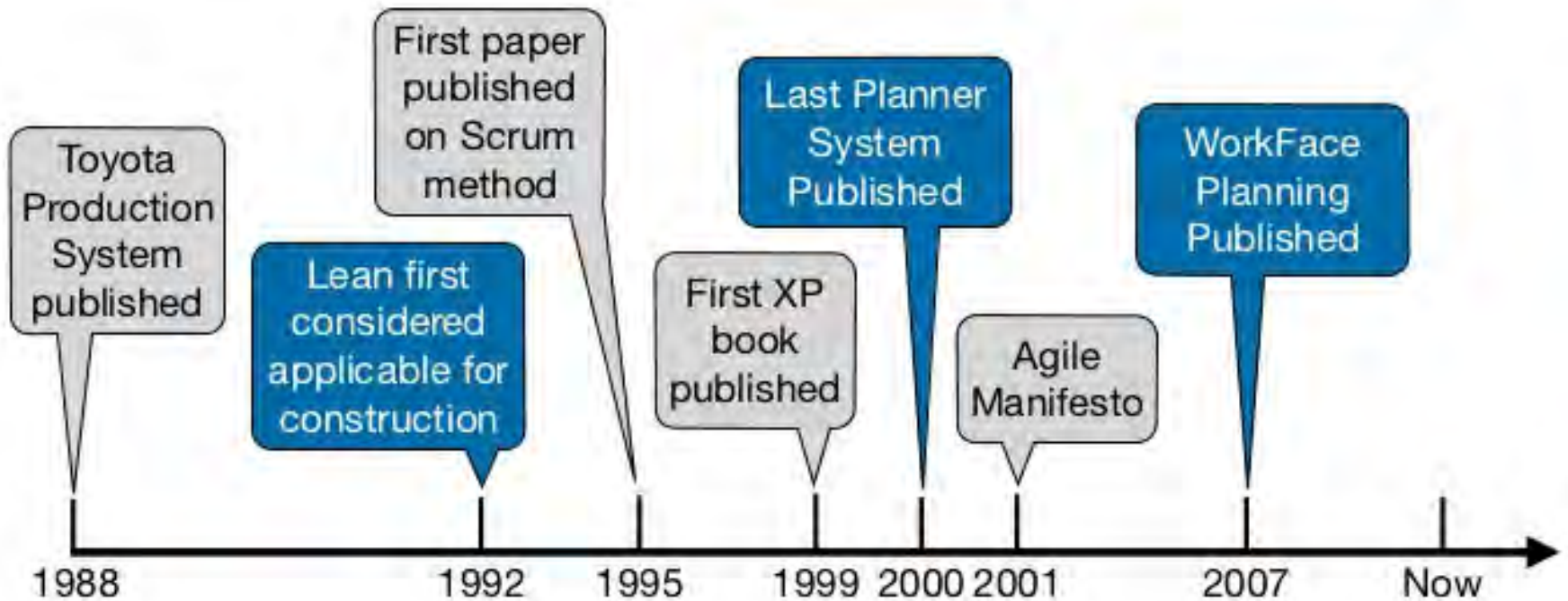


Waste in Construction



Eastman et al., BIM Handbook, John Wiley and Sons, 2009

Timeline: Lean in Construction



copyright Ennova 2011

Lean Manufacturing vs Lean Construction

SHARED PRINCIPLES

Optimisation of entire system through **collaboration** and systematic **learning**

Continual improvement and pursuit of perfection **involving everyone**

Focus on **delivering the value** desired by the owner/client/end-user

Creating flow through eliminating obstacles to creating value and eliminating processes that create no value

Creating pull production

DIFFERENCES

Construction projects are generally unique (one-of-a-kind) prototypes

Multiple contractors/suppliers act have varying contractual relationships

Construction environments are typically outdoors and/or difficult to control

Geographic separation of teams adds complexity to coordination and information sharing

www.ennova.com



We're Not Alone!



SKANSKA



IGLC



Most Common Causes of Construction Overruns

- Poor or incomplete design and documentation
- Client scope change during construction
- Mistakes during construction
- Delays in decision making or instructions
- Poor communication and information dissemination
- Poor planning and scheduling
- Weather
- Labor skills, availability or disputes
- Incorrect material types or quantity

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Lean Principles



Lean on Site: Tools, Process and Culture



Tools: Site Schedule

Day of Week, Date >> Monday, (date?)

Tuesday

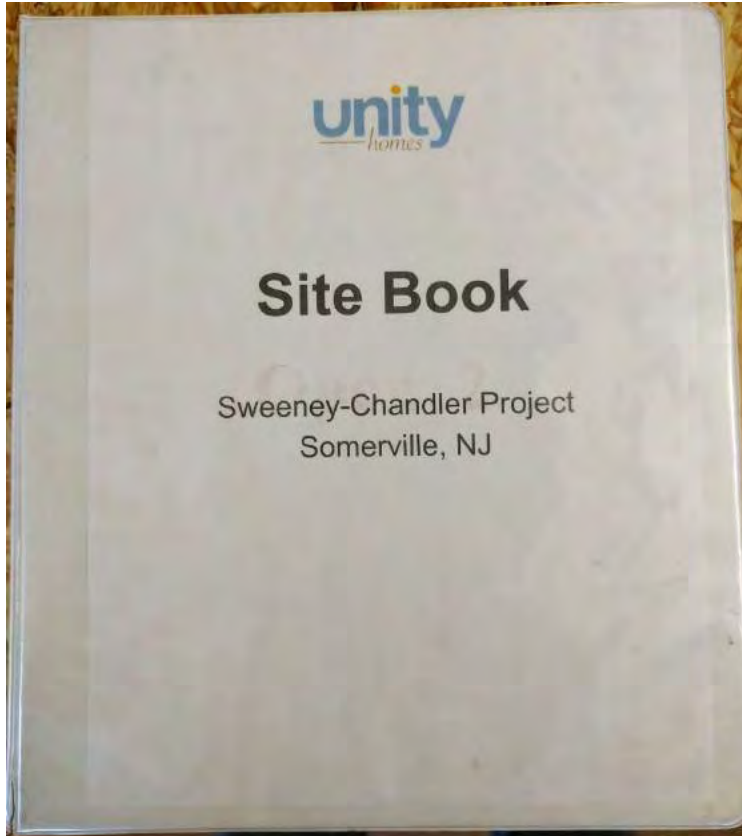
Wednesday

Thursday

Friday

Truck #, Trailer Type >>	Truck 1 Step deck		Truck 5- 8am	Truck 7	
Time on Site >>	8am	8:00am	8am	8am	
Materials on Truck >>	W03, W02, W05, OIO3, Timber brackets, truss sheathing		OXO1,OXO2, OXO3,OXO4,OXO5,	RO3,RO5, GAR Roof Apps, Timber Brackets	
	1 pm Truck 2 Step deck- WO1,W04,W07				
	Truck 3- Flat Bed 3pm	Truck 4- step deck 10:00am	Truck 6 10am- step deck		
	W06,OIO1,OIO2,intO1, interior timberframe	Pod 1 and 2	RO1,RO2,RO4, Ext timber posts ext timber plates		
Crane Start Time >>		7am	7am	7am	7am
	1350.050 Travel labor				
Tasks & Times: 7:00	1360.050 - Shipping - Site truck 1	6118.050 - Interior Partitions-Site	6130.050 - Timber Frame-Site Labor	6192.050 - RP Custom - Site	6192.050 - RP Custom - Site
8:00	6129.050 - WP Custom - Site Labor	Set interior 21 than int timberframe	Ext posts, 106,113,105,	RF C01, C02	RF F01, F02
9:00	Start with 701 bump (4 picks)	Int05,15,19,22,23			
10:00	Than F02 (3picks) next 301 bump(4 picks)	Int,35,36,37,27,28	6119.050 - Ceiling Joist Framing -Site	RF-C03, C04	RF- F03, F05
11:00	1360.050 - Shipping - Site truck 2 unload	Int 29,30,31,32	Ext porch wall 02, ext CL01,Ext CI02,		
12:00		Set pods	chek wall 02		RF- porch 01, 02
12:30		Int 33, 34,25,26,		RF-C05, CHK wall01	
1:30	501 bump (4 picks)	Int 17,18,16	Ext porch wall 01		CRKT Pcs
2:30	C02,302,B02	CL 07,08,03,04,05	Chk wall 02	6130.050 - Timber Frame-Site Labor	
3:30	F04,F05,702,D04	6117.050 - Exterior Deck Framing - Site	Prep for Roof	timber plate 117	Clean up for weekend
4:30	602,D02,E02	Deck 02, 01,04,03			
5:00	22 picks	32 picks	10 picks	8 picks	








Tools: Site Book



Rogers-Ruggert Plumbing Fixture Schedule

unity
homes

Date: 8 JULY 2015

Fixture	Fixture Type	Manufacturer	Model Number	Finish	Quantity
	Sink	White	1000-10-001	White	1
	Toilet	Exhaust Valve 1/2" x 1/2" x 1/2" x 1/2" 1/2" x 1/2" x 1/2" x 1/2" 1/2" x 1/2" x 1/2" x 1/2"	1/2" x 1/2" x 1/2" x 1/2"	White	1
	Shower Head	White	1000-10-001	White	1
	Light Switch	White	1000-10-001	White	1
	Toilet Paper Holder	White	1000-10-001	White	1
	Kitchen Faucet	White	1000-10-001	White	1
	Kitchen Sink	White	1000-10-001	White	1



Tools: Site Signage

unity[®]
homes

AIR TIGHT CONSTRUCTION



OSB= Air Barrier



Majpell= Air Barrier



No cutting, stapling or drilling air barriers! Trades are responsible for properly air sealing any necessary penetrations. See supervisor.

No combustion heaters, air tight construction poses carbon monoxide threat.

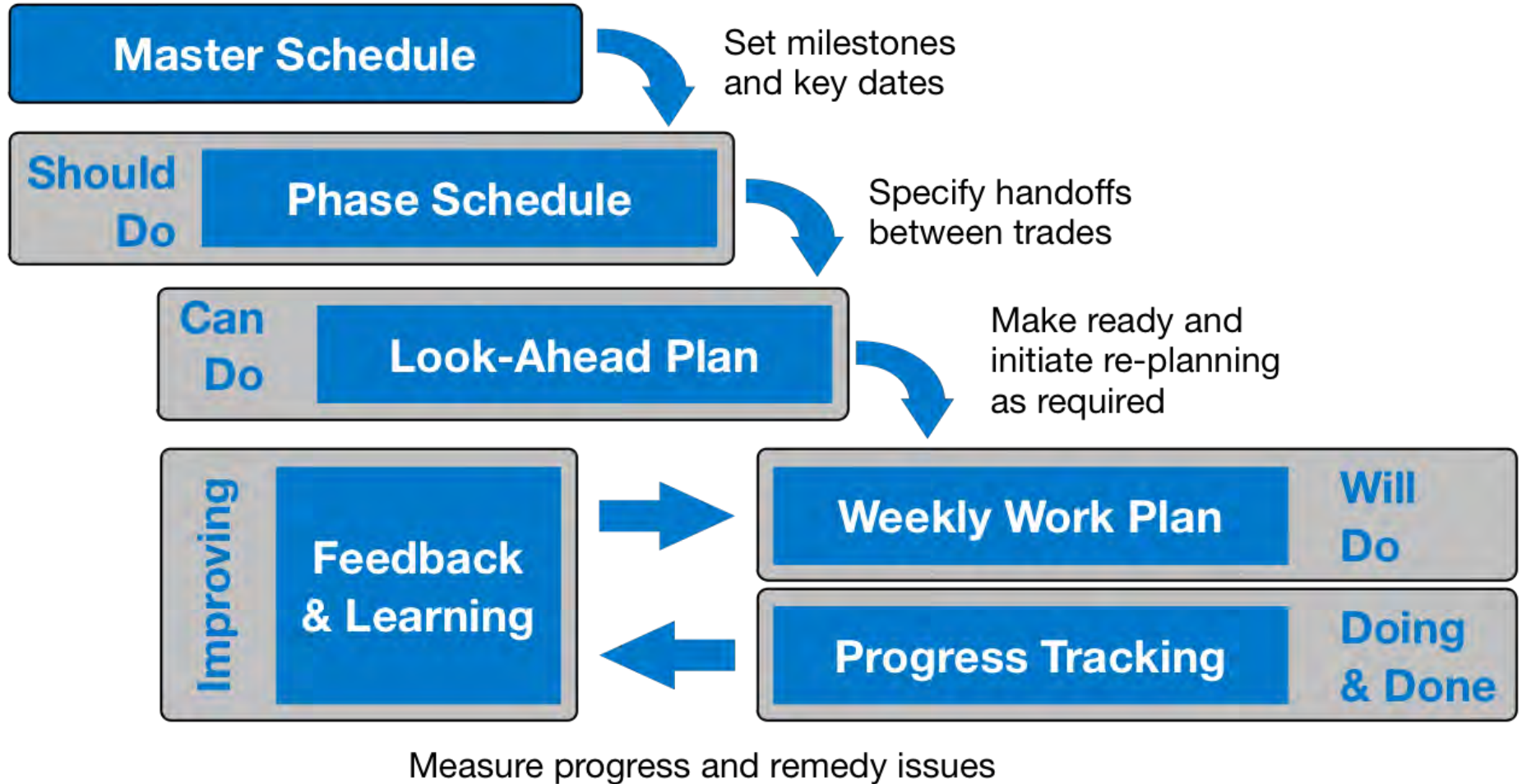
Process: Pre-sheathing Truss Roofs



Process: Bath Pods



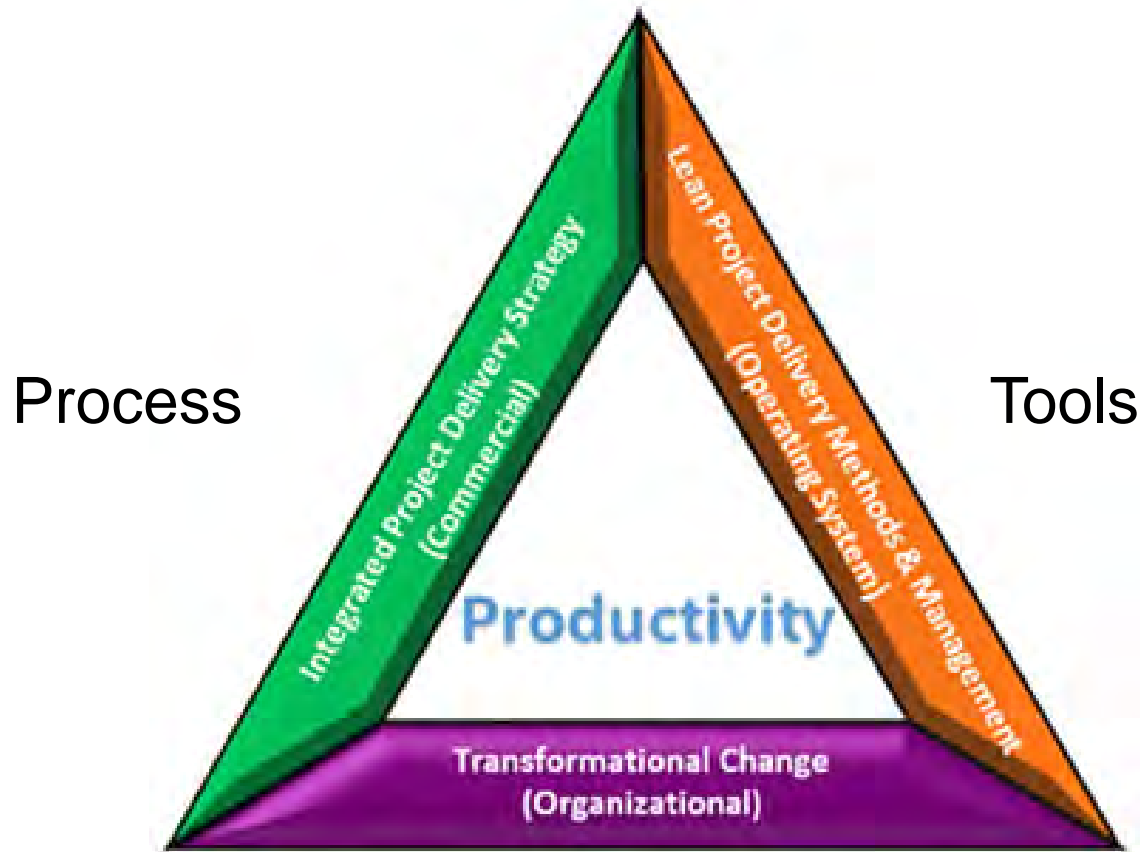
Process: Last Planner System



Culture: Early Stakeholder Involvement



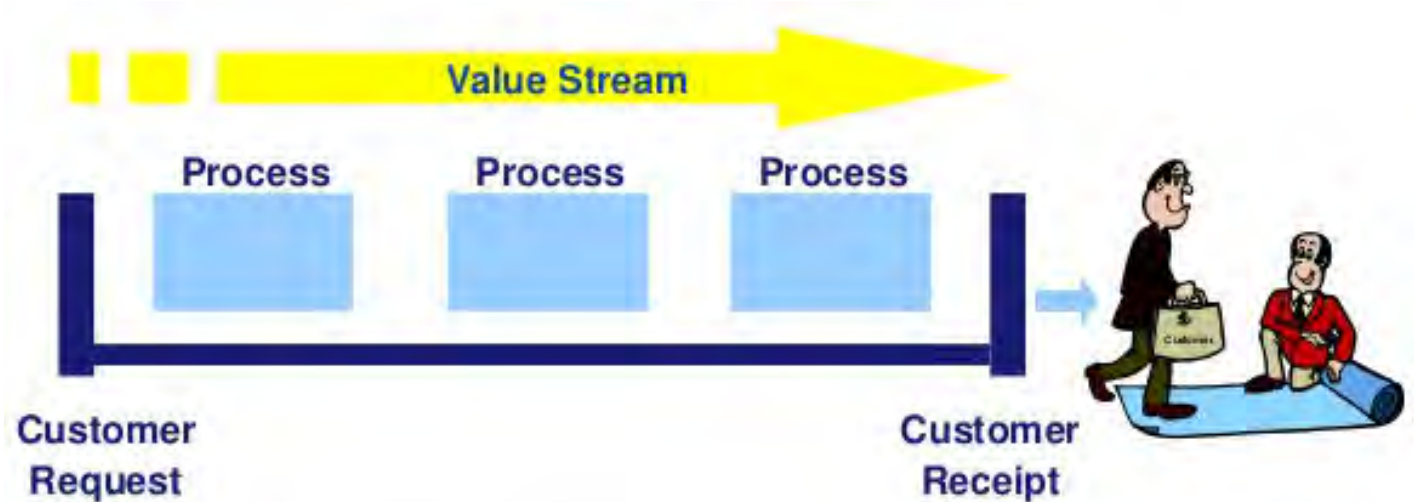
Lean in the Office: Tools, Process and Culture



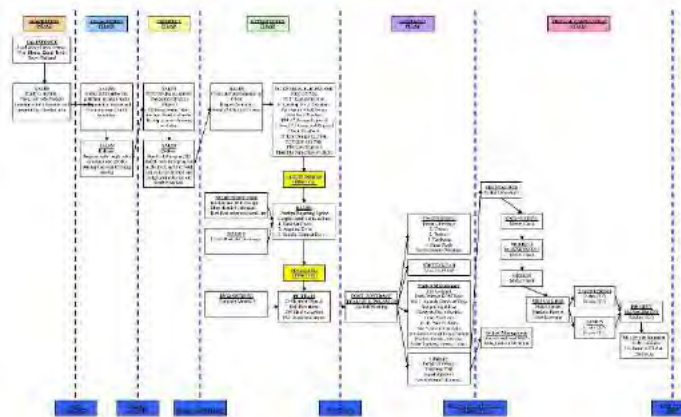
Tools: Value Stream Mapping

If you can't describe what you are doing as a process,
Then you don't know what you are doing.

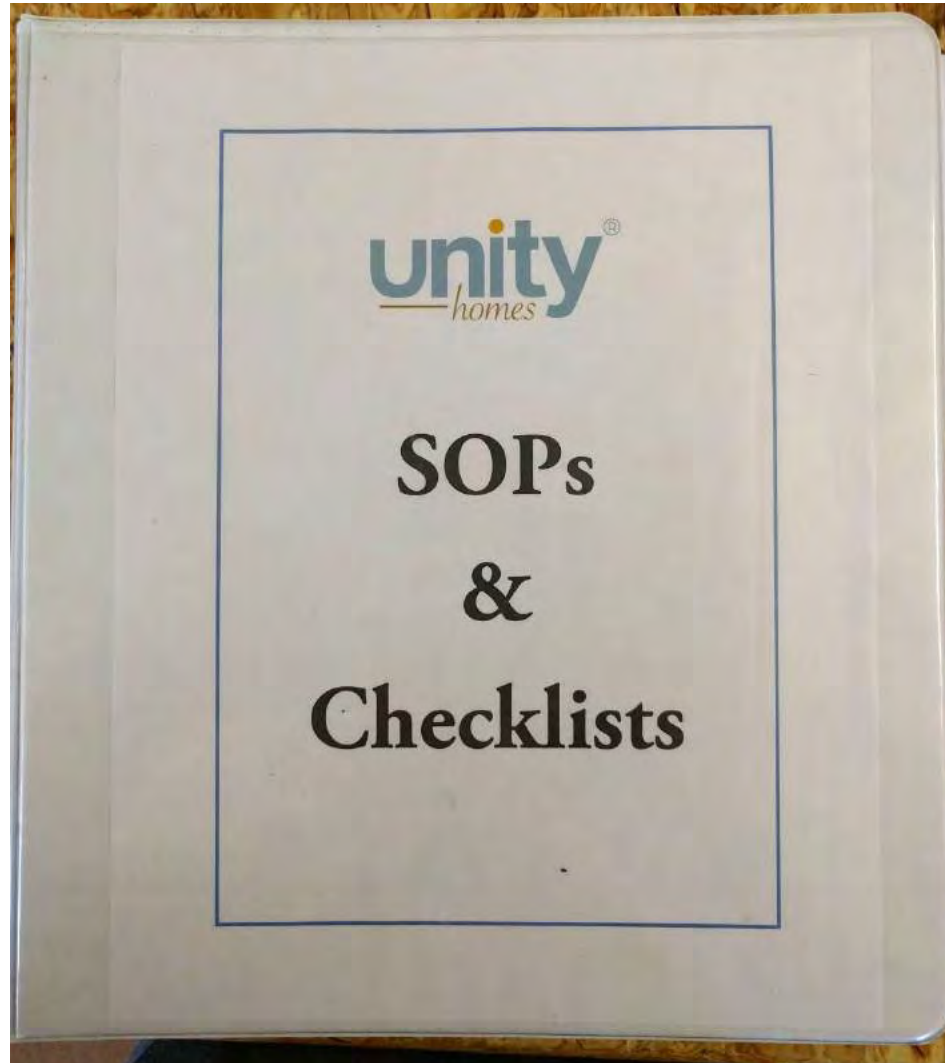
—W. Edwards Deming



Tools: Value Stream Mapping at Unity



Tools: SOPs and Checklists



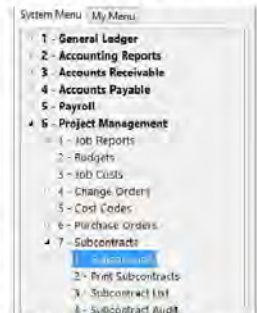
Creating Subcontracts - Standard Operating Procedure

14JUL15

Created by: Dawson Oot

Description: This SOP will cover how to create a new Subcontract within the Unity Homes guidelines.


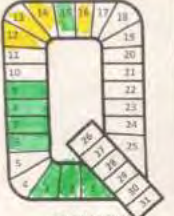
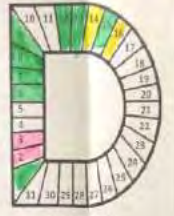
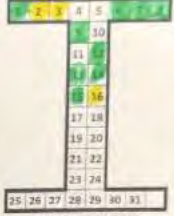

- Before opening Sage and beginning this process, please ensure that you have the following items
 - Scope of the work being completed by subcontractor
 - Dates of engagement
 - Vendor information
 - Cost Code(s)
 - Subcontract Amount
- Open Sage 100 Contractor application
 - A small popup window will open entitled "Company List"
 - Select *Unity Building Technologies, Inc*
 - Click "Open"
 - Enter your username and password when prompted (ask your team leader if you have not been provided with this information)
- Open a new Subcontract (6-7-1)
 - Under "System Menu" on the left of screen
 - Click dropdown arrow next to "6 - Project Management"
 - Click dropdown arrow next to "7 - Subcontracts"
 - Double-click on "1 - Subcontracts"
- As with every process in Sage, all of the fields marked with an * MUST be completed in order to finalize document. Start by completing the necessary fields in the upper section.
 - *Job*: Input the Job # (if you know it) and press Enter. If you do not know the Job # you can click the down-arrow next to the *Job* field and then select the correct job from the provided list.
 - *Phase*: N/A
 - *Vendor*: Input the Vendor # (if you know it) and press Enter. If you do not know the



Process: Flash Meetings (aka “Q-DIP”)

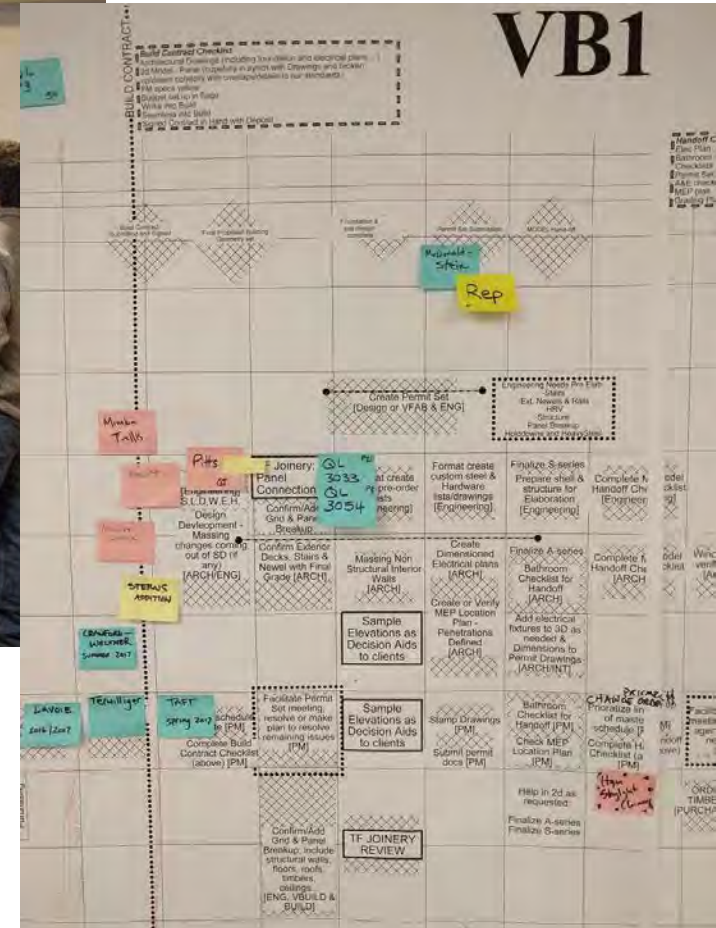


Dept: UNITY +QDIP for PMUnityIGC Date: December, 2016

 <p>SAFETY</p>	 <p>QUALITY</p>	 <p>DELIVERY</p>	 <p>INVENTORY</p>	 <p>PRODUCTIVITY</p>
<p>Green</p> <ul style="list-style-type: none"> - not stressed, - working well - inspired <p>Yellow:</p> <ul style="list-style-type: none"> - stress building - workload building <p>Red</p> <ul style="list-style-type: none"> - stressed - can't meet deadlines - need help 	<p>1) Quality of information or product received into dept. AND 2) Quality of information or product sent from dept (reflected by receiving a deviation report or notification)</p>	<p>Incoming: Was information or product received into dept. in a timely manner?</p>	<p>Is all material readily available? Includes:</p> <ol style="list-style-type: none"> 1) consumables -software, paper, and any other equipment needed 2) Project/task specific materials 	<p>Outgoing: How was your output, did you attain your production goals and meet deadlines?</p>

z:\Departments\CIT\S\CITLean\Helena-Lindbacks Inspired\Daily Flash\SQDIP Templates

Process: Obeya - the “Big Room” - and Visual Planning

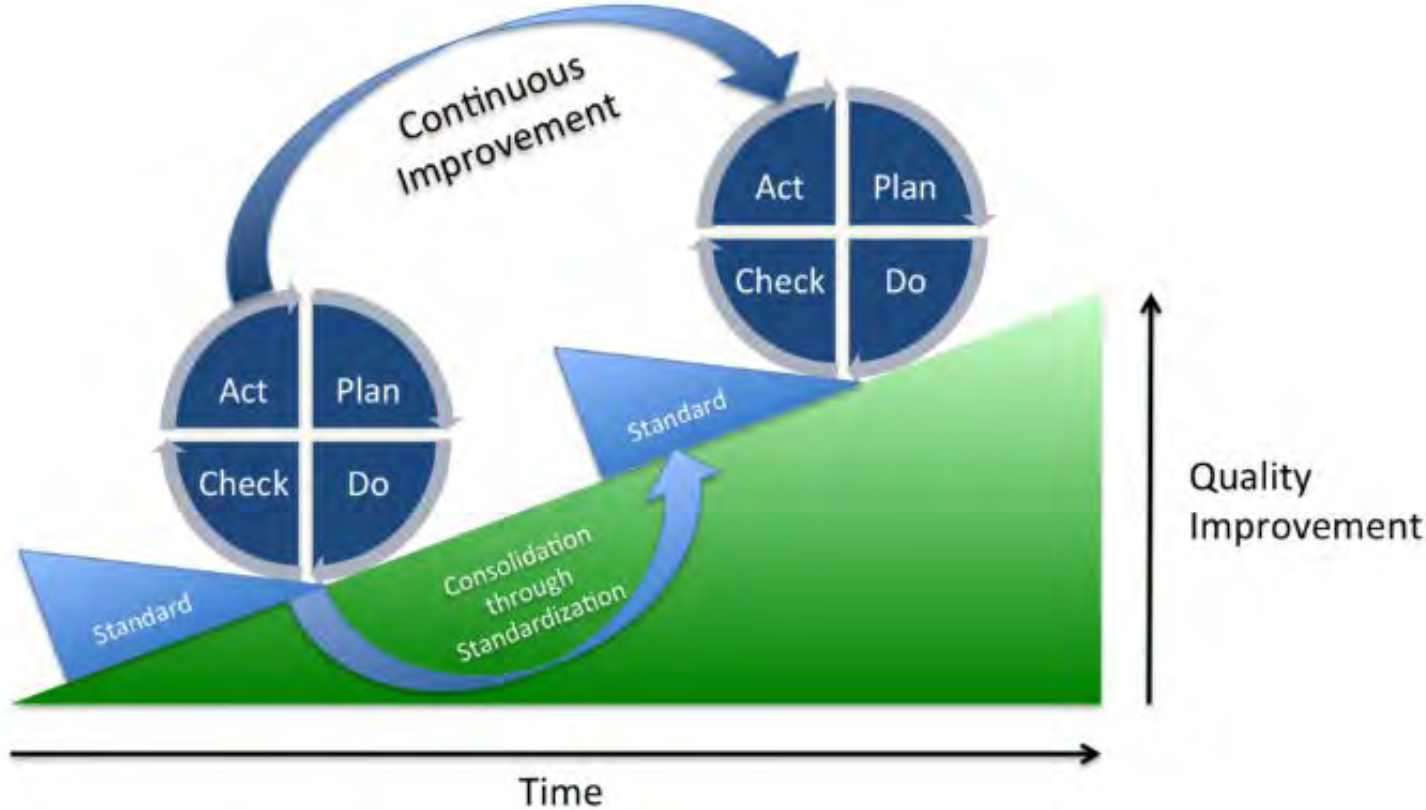


Improvement Task Chart

IMPROVEMENT	BEST IDEA	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	DUE	LEADER
<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>		<i>[Handwritten notes]</i>
<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>				<i>[Handwritten notes]</i>
<i>[Handwritten notes]</i>		<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>	<i>[Handwritten notes]</i>		<i>[Handwritten notes]</i>



Progress Through Continuous Improvement



Culture: “Each of us has two jobs”



Culture: Shared Leadership



Acela Locomotive



Shinkansen "Bullet" Train

Lean Process

Inspiring and Empowering People

Raising quality

Applying kanbans, kaizens and Value Stream Mapping
to get rid of muda, mura and muri*



*uneven production) [muda](#), waste [mura](#), overworking [muri](#)