LEAN (Kaizen) Case Study

Macy's Phase 1

A transformational model that supports cultural change through the analysis and reduction of waste

LEAN INTEGRATED

Legal Company Name:	Lean Integrated LLC
Contact name:	Mike Weishaar
Contact phone number:	(425) 418-2465
Contact e-mail address:	mike@leanintegrated.com

LEAN
INTEGRATED

Macy's General Project Description

- Historically designated landmark building
- 0 lot line full city block in Downtown Seattle with minimal lane closures
- Macy's continuing to operate daily 10am to 9pm
- Noise restrictions 11pm to 6am with a hotel across the street
- Transit lane closures to all traffic on the delivery access street 7am to 9am daily
- 7 - Reinforced concrete shear walls 20' long and 24" thick through all 11 stories. 400 yard footings to support shear walls
- Excavated material for foundation of shear walls 1/3 removed by 3 yard clamshell bucket on a crane and the remainder in handcarts up the service elevator
- 24" x 20" HSS coordinating steel and bent plate, full length between all shear walls. Over 10,000 linear feet.
- Atrium cut through concrete floors 7 & 8 - 2,500 square feet each
- New elevators installed, two 11 story shafts
- Community clear story penthouses & deck on roof
- Complete HVAC, Plumbing, Electrical upgrade
- Extensive skylight installation to provide light on 8th floor
- Lobby's added on floor 2 & 6

EXECUTIVE SUMMARY

Phase 1 Review June 2016 – June 2017

Bayley began their Lean journey in June 2016. Training began on the Last Planner Scheduling (LPS) system which included;

- Pull planning the entire job in weekly time buckets
- Detailed planning in daily time buckets incorporating the 6 week look ahead
- Task list management
- Percent Planned Complete
- Process optimization with sub-trades

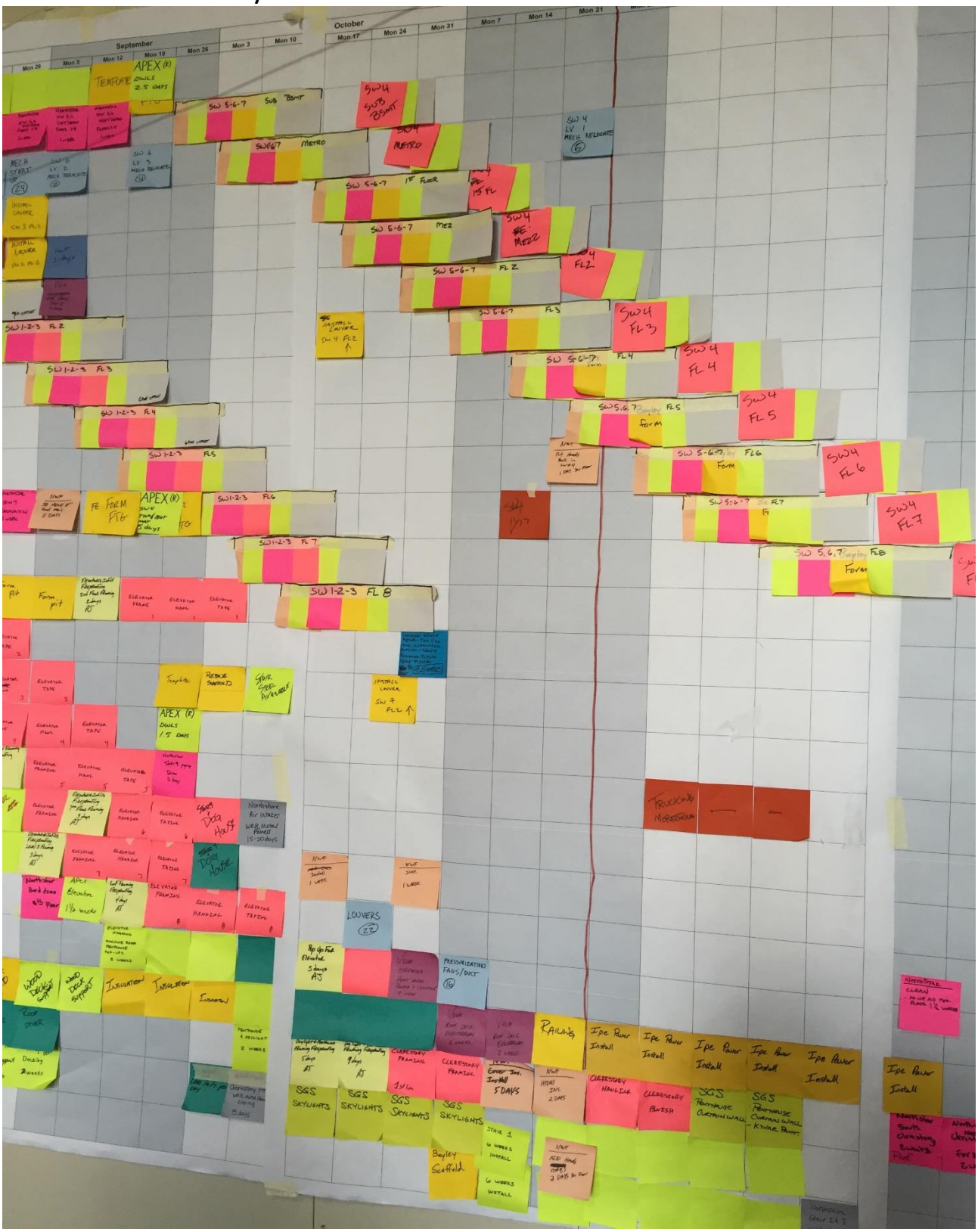
Pull Planning – Last Planner Schedule

Pull planning began with scheduled meetings which included the leadership from all major trades. Beginning with the standard project planning software, Bayley management laid the groundwork for collaborative planning starting with the last planner. The fundamental difference between pull planning and standard project management is that pull planning asks the questions, what are our key milestones, and what resources do we need to achieve them, vs, standard planning asking, what resources are you (the sub-trades) going to commit to this job. In pull planning the sub-trades first discover the amount of time they have available to complete a specific milestone, then apply the resources required to meet that date. In standard planning the sub-trades see the end date for the entire project, then commit the resources they feel are necessary for the entire job. The term “pull planning” describes another fundamental difference between the standard planning and the last planner scheduling process. Pull planning begins the planning process by asking the question, what is the final step in the completion of a specific milestone. If that step is an inspection, the inspector becomes the last planner.

The photo of the Last Planner Schedule on the following page demonstrates the teams early adoption of cascade scheduling. Note the varying color post-it’s that flow diagonally from the upper left to the center right of the photo. One of these cascading schedules is for the shear walls 1-3, the other is shear walls 4-7. Each color post-it represents a specific trade on the job. Upon further inspection, you will note that the post-it colors for each step of the cascading schedule, repeat again and again. You will also note that each step overlaps three subsequent and likewise, three prior steps. Planning the entire job in this fashion allowed each sub-trade the opportunity to establish appropriate resource allocation based on his understanding of the number of crews, and the number of people on those crews, required to support the planned work.

Once work began on the shear walls and seismic steel, it became apparent that the plan would need to be broken into daily tasks for each trade. The Macy’s project would require at many points more than a dozen trades on site at a given time, coordination of tasks was key to providing a smooth flow of events. The 6 week look ahead provided the opportunity to effectively plan this level of complexity.

Macy's Last Planner Schedule in June 2016



6 Week Look Ahead

The 6 week look ahead (6WLA) was implemented to enhance the effectiveness of the last planner schedule. Where the last planner schedule utilizes weekly time buckets, the 6WLA utilizes daily planning. The Lean methodology which supports the 6WLA is a combination of trade collaboration applied through the application of Genchi-Genbutsu, or go and see. The trades walk out to the area of the jobsite they are planning and look at the work to be completed. They establish the sequence of work, the handoff criteria, the laydown areas, the travel paths and the timelines. They then return to the big room where they solidify their plan on the 6WLA documents pictured below.

Note that the post-it's are organized in value streams, or swim lanes. Rather than planning the work of each trade horizontally across the 6WLA, the pathway of each subtask is planned, supported by each trades commitment in order of completion. Also note that there are actually 12 – 10 foot panels in this photo. The complexity of this job required 20 foot tall panels to sufficiently address the detail. The six panels on the right actually belong under the 6 panels on the left.

The effectiveness of the 6WLA was established during the planning of the shear walls and seismic steel. Both processes were in danger of becoming significantly behind schedule. Michael Williams, the Bayley Construction Vice President of the Macy's project met with Kelly Huestis, the Apex Steel Vice President assigned to the Macy's project, to establish a partnership designed to shore up the schedule for both the shear walls and seismic steel installation. Together they decided to meet for two hours each week, one for seismic steel, one for shear walls. Since time was becoming more constrained, they scheduled these meetings for 5:00am on Tuesday and Thursday each week. As part of their partnership, they agreed that Michael would lead the meetings but that Kelly would be the fill in when Michael was unavailable.

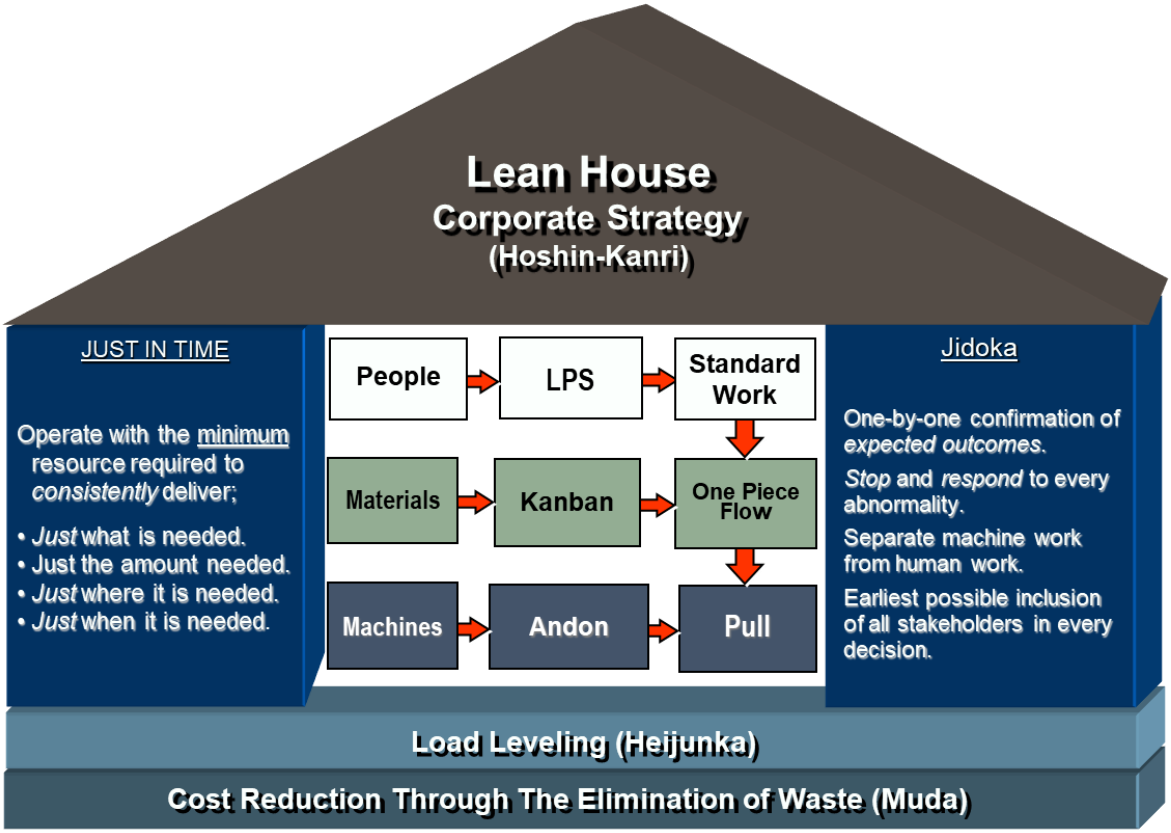
All trades involved in the erection of the shear walls and seismic steel were required to attend these meetings. The rule was that the post-it's belonging to each trade, could only be posted or moved by that trade. It was also a requirement to engage in the process. Trades were not allowed to sit back and watch others plan, they were obligated to participate in earnest. In short order, the team began to gel and the schedule began to constrict. Within a few meetings, the shear wall team had increased their weekly pours from 2 to 5 and the seismic steel team increased from 2 to 14 tubes installed in a single night. The cost savings generated are difficult to establish, but it would not be a stretch to say that this team saved the job many hundreds of thousands of dollars.

It is important to note that the role of management is key to a successful Lean rollout. Both Michael and Kelly held the team's feet to the fire. When members of the team flinched at the aggressive scheduling process, they asked those members to trust that the rest of the team would achieve their commitments. If team members missed a meeting, they called in a replacement and asked that team member to ensure he had replacements available for any future scheduling conflicts. They walked the job with the trades and worked through the seemingly infinite detail required to meet the schedule. It is also important to note that the representatives from each trade worked in earnest with the rest of the team. Each member stepped up and made commitments that relied on their sub-trade partners commitments. Step by step as commitments were met, trust increased and the schedule constricted yet again.

Another important step in the Lean transformation model began to appear. The trades were utilizing the 6WLA to collaborate outside of scheduled meetings and without the contractor's participation. We overheard one trade ask another to cut a hole in a wall to avoid the necessity of routing the ducting around it. As the trades began working together to solve problems for each other, the percent planned complete began to increase.

Each day the Bayley team, leads a meeting at 6:30am with all the trade leadership to review the previous day's work, the plan for today, and to identify work requiring further detailed planning. At this meeting, the team utilizes the task management process. Task management is a simple, perpetual list of items that are required to assure the efficient flow of work. These are items that do not fit on the 6WLA. By way of example, the team decided they could move more quickly on shear wall pours if the sub-trade could deliver shotcrete with two trucks per lift. The task of contacting that trade to establish the feasibility of delivering two trucks was assigned to the contractor general superintendent. The task was captured on the task list, with the specific details of the task, general super's name, and the date the task would be completed. Multiply this by the many hundreds of tasks that were not previously managed by the team, and the result was significant improvement to the 6WLA outcomes, reflected again in an improved percent planned complete.

Genchi-Genbutsu is a Japanese term that means, go and see with your own eyes. The Bayley team began to employ this key Lean methodology to the 6WLA. Genchi-Genbutsu is the application of visual management, a component of Jidoka. Jidoka, as pictured in the Lean House below, is one of the two pillars of the Toyota Production System, the other is Just in Time. While just in time brings issues to the forefront, jidoka is the response to those issues.



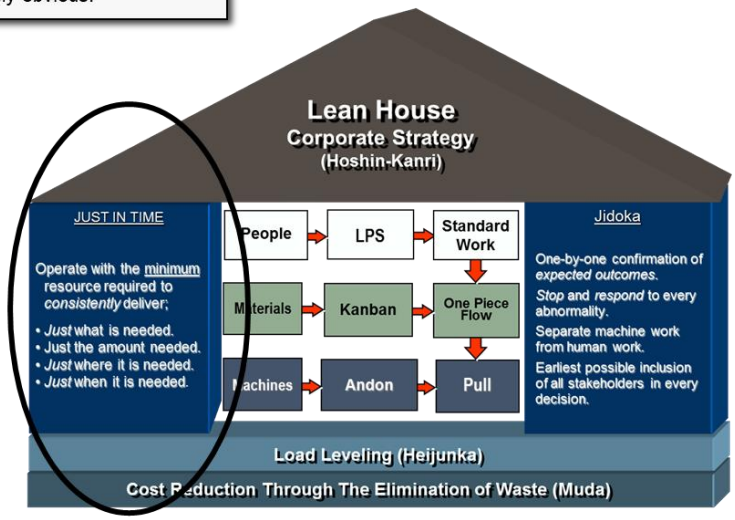
While the team had made significant progress using the last planner schedule, 6WLA, and task management tools, the sub-trades were still, all too often, reporting that they were missing commitments. The 6WLA had provided the detail necessary to bring this issue to the surface. Again, the key role of just in time is to expose issues that were previously hidden. Since Jidoka is the Lean methodology of responding to these issues, the team asked the question, how do we ensure one-by-one confirmation of tasks to be completed on an incredibly complex jobsite? What would be our application of “stop and respond to every abnormality”?

To answer that question, the team decided to work toward the application of true Lean methodology as demonstrated in the Lean House models below. While Lean for construction in today’s world relies heavily on the last planner schedule, the true application of Lean methodology provides significantly more impact.

JIT reveals abnormalities and problems in the construction system by making inconsistent results immediately obvious.

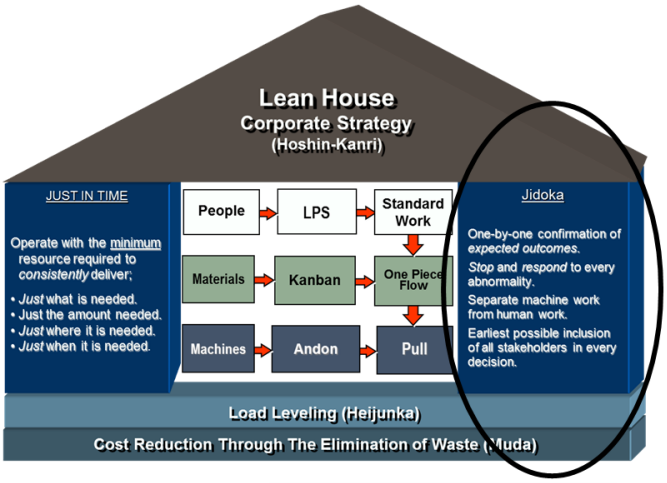
Through JIT construction, we minimize cost by revealing and eliminating overproduction and operating only with the minimum required capacity resources.

JIT drives continuous improvement through the elimination of waste.



Visual management and level production support the JIT pillar by helping to reduce and reveal inconsistencies in the process.

Jidoka drives continuous improvement in the quality and reliability of every process.
Jidoka is the response to problems that enables system improvement.



Team Members use Jidoka to assure and improve process and product quality through a four step process.

1. Detect Abnormalities.
2. Stop.

Set up the construction system to detect abnormalities and stop itself so quality is not affected.

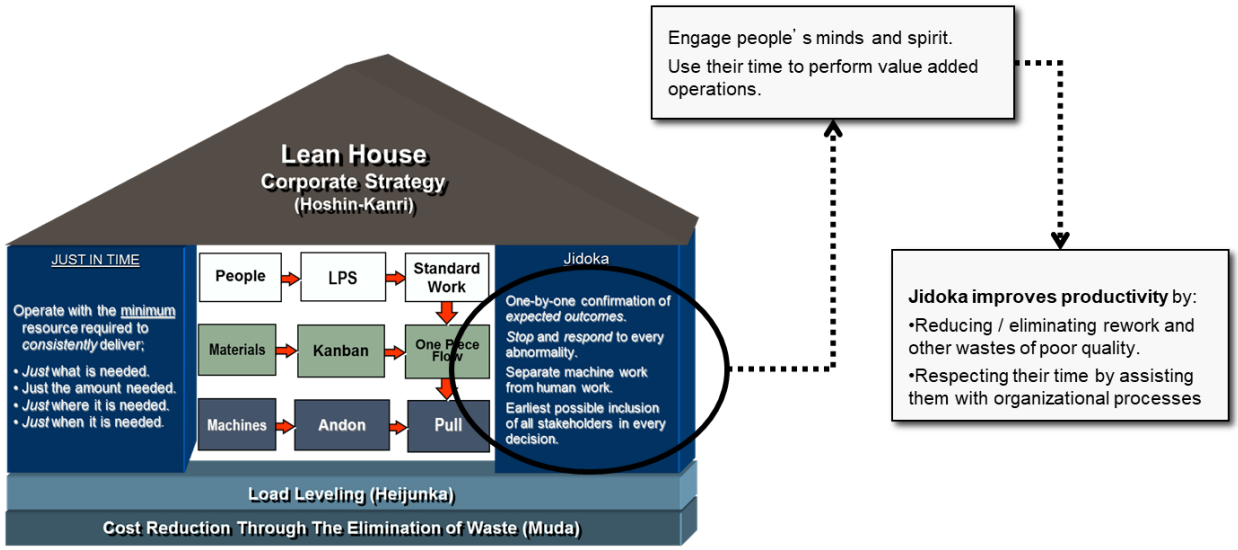
3. Fix or correct.
4. Install countermeasure.

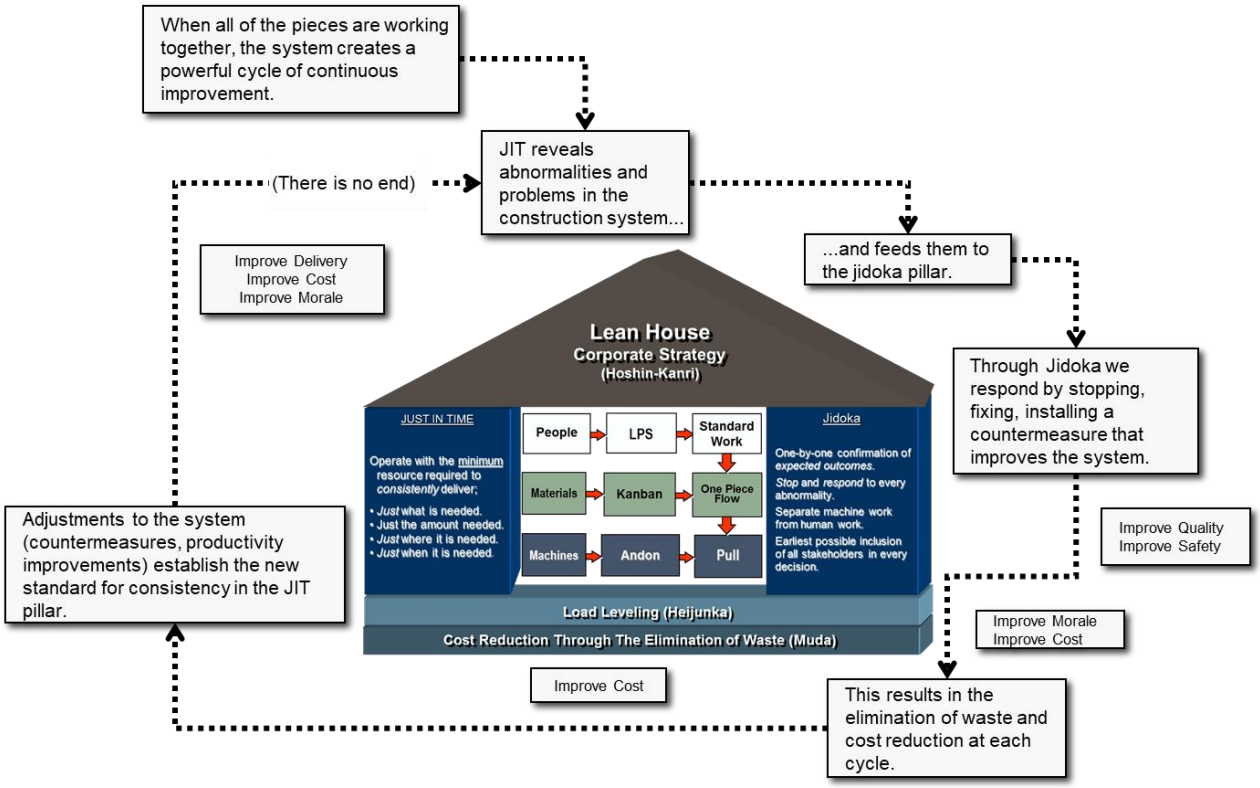
The management system responds to abnormalities and installs countermeasures.

Assure quality of everything by **confirming the outcome of every process step.**

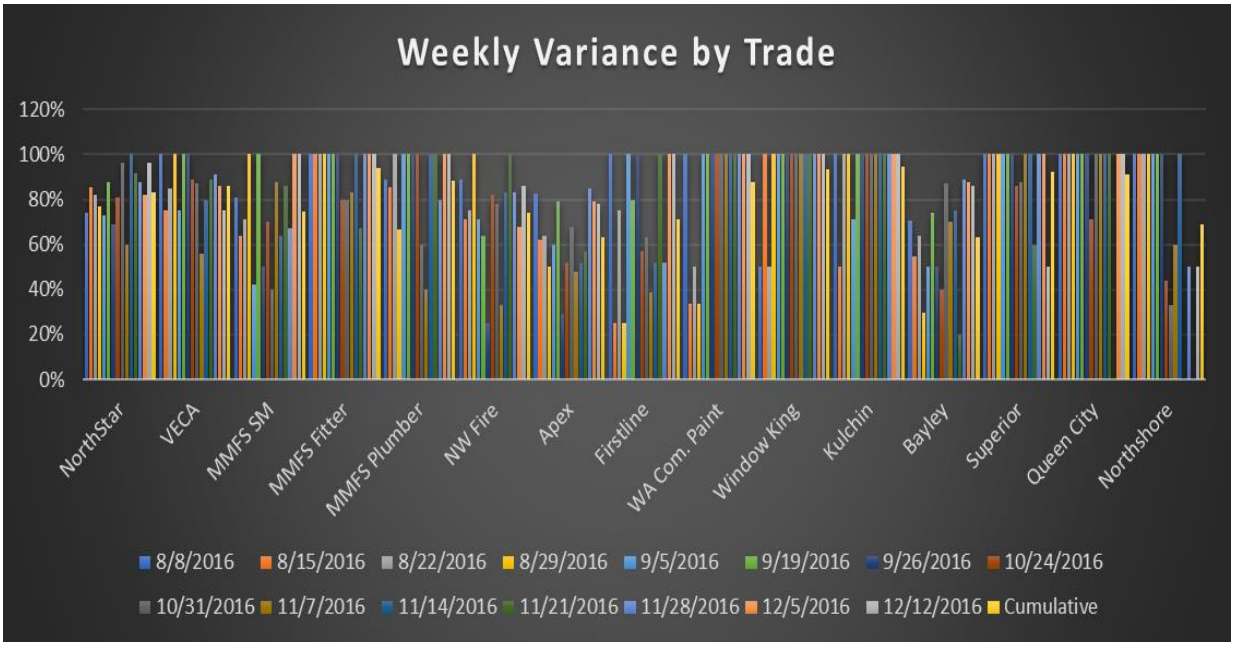
Management System Response:
Assist Trades with Countermeasures.

Level workload supports the Jidoka pillar by enabling one-by-one processing and establishing a visual standard for normal conditions.


Engage people's minds and spirit.
Use their time to perform value added operations.
Lean House
Corporate Strategy
(Hoshin-Kanri)
JUST IN TIME
Operate with the minimum resource required to consistently deliver;
• Just what is needed.
• Just the amount needed.
• Just where it is needed.
• Just when it is needed.
People
LPS
Standard Work
Materials
Kanban
One Piece Flow
Machines
Andon
Pull
Jidoka
One-by-one confirmation of expected outcomes.
Stop and respond to every abnormality.
Separate machine work from human work.
Earliest possible inclusion of all stakeholders in every decision.
Load Leveling (Heijunka)
Cost Reduction Through The Elimination of Waste (Muda)
Jidoka improves productivity by:
•Reducing / eliminating rework and other wastes of poor quality.
•Respecting their time by assisting them with organizational processes


When all of the pieces are working together, the system creates a powerful cycle of continuous improvement.
JIT reveals abnormalities and problems in the construction system...
(There is no end)
...and feeds them to the jidoka pillar.
Improve Delivery
Improve Cost
Improve Morale
Lean House
Corporate Strategy
(Hoshin-Kanri)
Through Jidoka we respond by stopping, fixing, installing a countermeasure that improves the system.
Improve Quality
Improve Safety
Adjustments to the system (countermeasures, productivity improvements) establish the new standard for consistency in the JIT pillar.
Improve Morale
Improve Cost
Improve Cost
This results in the elimination of waste and cost reduction at each cycle.

The idea to apply "one by one confirmation of expected outcomes" by walking the jobsite daily, came from Wade Meyer, the Bayley construction executive project manager for the Macy's project. The idea was to assign each of the six contractor superintendents to a section of the jobsite for multiple daily walks. Each superintendent photographed his section of the 6WLA on his cell phone and walked to each area at 8:00am and again at noon. If the crews were in the correct areas and on task, the super simply asked if there were any potential or real time issues affecting the expected work completion for the day. If the answer was no, the super moved on to the next task. If the crew was not in the planned area, or was not on task, the super invoked "stop the line" and worked with the crew foreman to get them back on task. This again had a significant impact on the percent planned complete. The team began to realize that the application of the fundamental Lean principle "visual control" through the jidoka methodology, was having yet again, a significant impact on the percent planned complete. In summary, when a team has immediate knowledge of either misplaced resources (trades not working in their planned area), or issues that are impacting the trades ability to make progress at the planned rate, they have the opportunity to react, collaborate, correct, then monitor the progress. Without these walks, the misplaced crews and or the issues impacting progress, were not discovered until it was too late to react. On one of the walks, the team discovered the roofing company was not using the specified underlayment required. This discovery saved an estimated $50,000.00 in rework.



In the above chart we can see that each trade was improving their percent planned complete over this 5 month period. At first glance, it appears that some trades are struggling more than others, to meet their commitments. However, upon further analysis, these trades find themselves characteristically near the end of each scheduled task. Therefore, they are absorbing the cumulative results of the variation inherent in highly complex project management. As the chart reveals, the ability of trades further up the value stream to meet their commitments, has significant effect on the trades further down stream. Also note that the contractors themselves, often find that the Lean process can overwhelm their own resources. As the JIT pillar exposes issues, the requirement to appropriately address those issues can be significant. Bayley has made significant progress improving their own percent planned complete.

Process Optimization with Sub-Trades

RFP Case Study Request
Window Removal and Installation Process Improvement
Trade Partnership
Bayley Construction, Macy's Project, Seattle WA.
June, 2016

Engaging trades in the Lean for Construction process
Case study; Manufacturing process improvement through Lean application
Bayley Construction, Macy's Downtown Seattle
Design/Build – Seismic Upgrade, Remodel

The trade responsible for the removal, glass replacement, frame reconditioning and re-installation of the 480 exterior windows of the Macy's building remodel, cautioned in June of 2016, that he anticipated missing his end of the year target date by approximately 6 months. Bayley asked if he would be willing to participate in a Lean process that could significantly increase his capacity through current process value analysis. He was receptive to the idea and invited the Bayley Lean team to come to his factory for a Lean review. The Lean team documented the process flow of value through the application of a tool called value stream mapping. Time studies were conducted to determine the "value added" vs. "non-value added" steps.

The Lean team then reviewed, timed and value stream mapped both the window removal and window re-installation processes. It is important to note that members of the window trade were involved in every step of the process. No time studies or process review events were conducted without trade participation. Upon completion of the Lean review, the window trade team was able to recalculate the appropriate distribution of manpower both on site and at the factory. They are now on track to finish the project by year end.

Another Lean process, called First Article Inspection was applied to the window refurbishment process. Through the application of this process the Lean team discovered improper paint color during the first window refinish run. Root cause analysis was applied to discover the cause of variation. Upon review, the team found that both the paint color and paint name matched the specifications. The variation was found to be in the base paint color of the paint manufacturer. The design team had used one manufacturer for the sample color, while the window trade used another. Had the Lean team not discovered this defect during the first run, the eventual cost of refinishing all the window frames for the entire job would have caused serious schedule delays and cost overruns.

Building relationships that support the flow of "project value" is key to successful outcomes. The Last Planner Scheduling process, supported by the 6 Week Look Ahead, can strengthen business relationships when properly applied through trade/contractor collaboration. This understanding was key to the successful application of Lean process with the window trade.

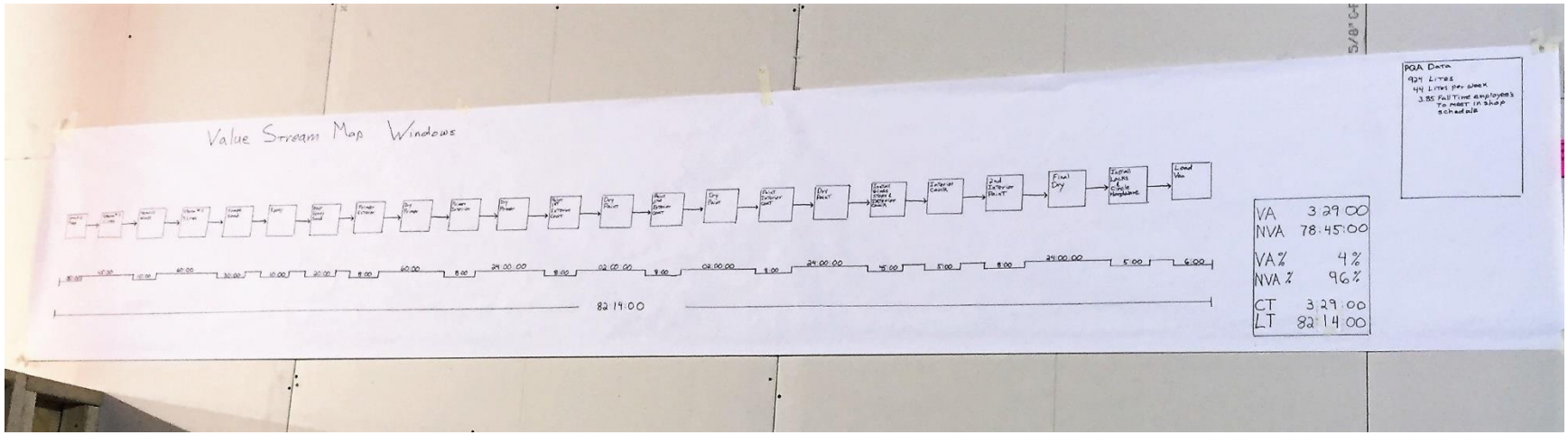


Photo of Window Manufacturing Value Stream Map on Job Site

Please note that much of the information included on this value stream map was obtained at the window manufacturing plant located approximately 60 miles from the jobsite. The owner of this sub-trade invited the Bayley Lean team into his factory to review and time each step of his manufacturing process. Upon completion of this time study, the entire team including the sub-trade owner discovered that he had understaffed the project by two team members. They also discovered that his crew would need to install 22 windows per week to meet the projected completion date. Understanding these requirements allowed him to monitor his progress weekly. The Lean team created standard work which included weekly planning to ensure that the painters were well ahead of the window installers, which in turn allowed the Bayley team to ensure the pathways and access issues were cleared ahead of the install.

Also worth noting, some of the windows were delivered with grey caulking around the panes and some with black. The initial reaction was that the manufacturer would be responsible to absorb the cost of reworking the windows, however, the Lean process led the team to ask the client whether the color of caulking would be an issue. The client told the team that caulk color would not be an issue, as long as the color was consistent by floor. Where contracts are written to avoid misunderstandings regarding who is responsible for just such issues, the Lean process focuses on client satisfaction rather than contract satisfaction. In this case, significantly increased costs and delays were avoided by elevating customer satisfaction above contract satisfaction.

Case study
Debris Removal Process Improvement
Macy's Retrofit and Seismic Upgrade
Bayley Construction, Seattle WA
June, 2017

Engaging trades in the Lean for Construction Process
Subcontractor: Northstar
Sub-trade: Demolition
Process: Debris removal

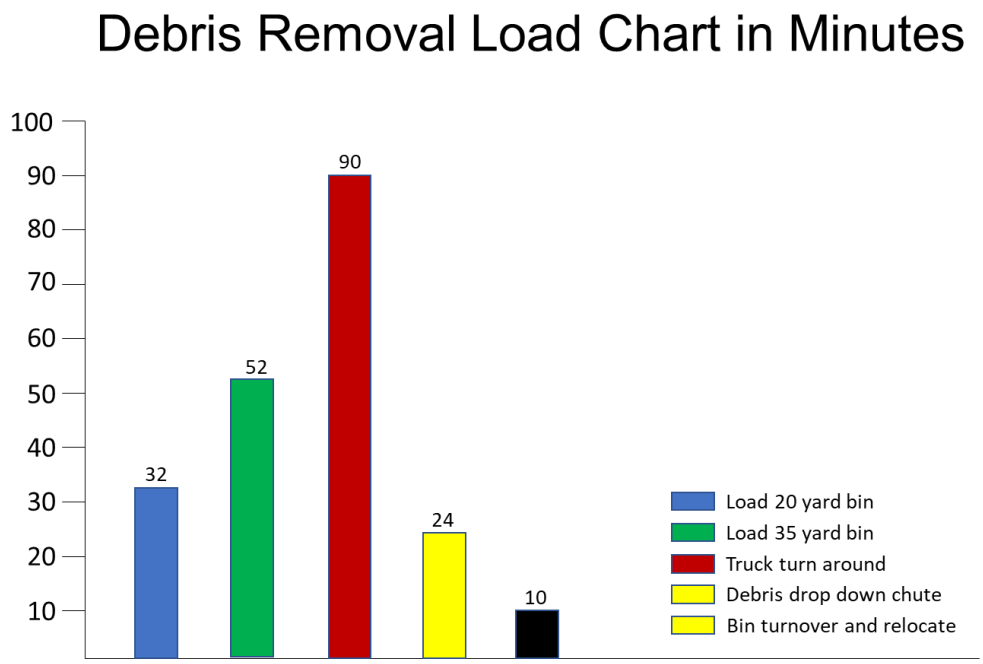
The trade responsible for the removal of debris at the Macy's project in downtown Seattle warned that they would be significantly behind schedule due to the constraints which were limiting their ability to efficiently remove heavy debris from the top three floors of the building, through a decommissioned elevator shaft, to the loading docks at the metro level on 3rd avenue. The issues they cited were, 1) noise variance restrictions allowed only 8 hours per day for debris removal, 2) access to the zero lot line building was limiting the number of trucks they could utilize, and 3) access to the loading docks was unpredictable as other trades also had limited access through the same loading docks.

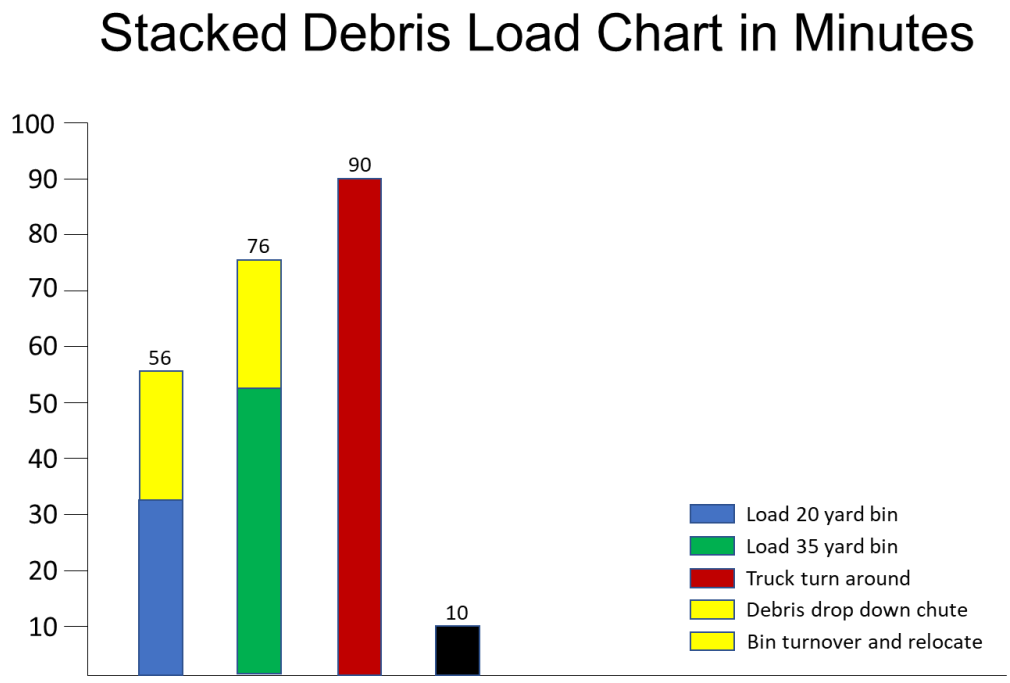
Bayley management asked the Northstar superintendent if he would be willing to partner with their Lean team to initiate a process improvement project. He reluctantly agreed at first, then became significantly more engaged as the results became apparent. The Lean team began the process by observing the steps required to complete one full cycle of debris removal. One Lean team member was placed at the top of the decommissioned elevator shaft to observe and time both the demo process and the debris removal process. The debris removal process included removing barriers, communicating with the team at the bottom of the elevator shaft that heavy debris would be dropping several stories to the bottom of the shaft, along with moving and dumping the debris down the shaft with a clam bucket type bobcat. A second Lean team member was placed at the loading dock to observe and time the truck loading and waste bin rotation processes.

The team quickly discovered that the constraint was the truck rotation process. Huge piles of demolished debris were piling up on each of the top three floors indicating that the demolition process was significantly faster than the debris removal from site process. Using standard time observation forms the Lean team established these key data points:

1. Debris drop down elevator chute 24 minutes
2. Load 20 yard waste bin 32 minutes
3. Load 35 yard waste bin 52 minutes
4. Bin turnover and relocate 10 minutes
5. Truck turn around time 90 minutes

The full rotation of a truck was 34 minutes longer than the 20 yard bin cycle and 14 minutes longer than the 35 yard bin cycle as indicated in the chart below. The theory of constraints tells us that improving any component of the process other than the constraint will have no effect on the overall process. Likewise, any improvement to the constraint will have immediate effect on the overall process. While the truck rotation process was on average 90 minutes, records indicated that the demolition company was removing two truck loads (two waste bins) of debris each day for the past two months. This data directed the Lean team to observe the truck rotation process in more detail. These observations revealed loading dock access as the main issue. Other trades onsite were using the loading docks to deliver materials, limiting the access for the demolition crew. While the truck rotation was 90 minutes, access to the docks was once every 4 hours.





The data now indicated that the demolition crew could remove on average 6 waste bins of material per 8 hour shift assuming 4 loads were 20 yard bins and 2 loads were 35 yard bins.

The Lean team informed Bayley construction that access to the loading docks must be restricted during the truck rotation process. Bayley implemented the new process, however, the demolition crew was unable to reach the 6 bin rotation goal. This new data once again directed the Lean team to observe

the truck rotation process. The team learned that on average the truck rotation was 90 minutes, however there were two key factors that were causing loss of flow. 1) The trucking company was not arriving onsite at the beginning of the shift. Sometimes missing the opportunity to remove the first load by two hours. 2) Traffic variation could cause significant delays as the trucks attempted to move through Seattle.

The demolition superintendent reviewed the data and decided to add a second truck to the rotation. On the first day both trucks arrived at the same time leaving one of the trucks parked and waiting for 76 minutes while the demolition crew dropped the debris and loaded the waste container. On day two, the demolition superintendent staggered the truckers start times and finally the 6 truck rotation became reality.

The Bayley Lean team, made up of two project engineers, relentlessly applied Lean principles until they obtained the desired results. The demolition superintendent Josh Knull, demonstrated key leadership skills as he approached the Lean process with an open and curious mind. The process was able to consistently provide 6 loads of capacity consistently. The cost savings generated are difficult to establish, but it would not be a stretch to say that this team saved the job many hundreds of thousands of dollars.

Next, the demolition trade again warned that they would be significantly behind schedule due to the constraints which were limiting their ability to efficiently remove approximately 30,000 cubic yards of soil in the sub-sub-basement. The issues they cited were 1) noise variance restrictions allowed only 8 hours per day for soil removal, 2) access to the zero lot line building was limiting the number of trucks they could utilize, 3) debris removal was limiting initial soil removal to single yard hand carts which traveled through retail merchandise storage areas to an elevator, and 4) once enough soil was removed to expose shaft access for the tower crane, soil removal would be limited to single, two yard lifts through the shaft.

Bayley management asked the Northstar superintendent if he would again be willing to partner with their Lean team to initiate a process improvement project. This time he enthusiastically agreed. The Lean team began the process by observing the steps required to complete one full cycle of debris removal. One Lean team member was placed in the sub-sub-basement to observe and time the loading of a single hand cart. Another observed and timed the travel path of the loaded handcart from the sub-sub basement, up the elevator and to the loading dock. Another observed and timed the removal of soil from the hand cart into the 20 yard and separately, into the 35 yard trucking company waste dumpsters, and another observed and timed the trucking companies travel time and bin rotation process.

The team quickly discovered that the constraint was in the truck rotation process. Just as the team discovered this constraint, the demolition crew removed enough soil to expose the tower crane shaft. New observations and timings would be required as the process had now changed significantly. Rather than hand carts moving soil through the merchandising areas, up the elevator and out the loading docks, the soil would now be moved by a single yard bobcat to a holding area near the tower crane shaft. The tower crane operator would lower the two yard clamshell bucket down the shaft where another bobcat operator would fill it from the holding area. The tower crane operator would then lift the bucket 11 stories through the shaft, rotate the crane to the opposite side of the building and lower the bucket to the trucking companies waste bins at street level. A crew at the street level would then stabilize and guide the bucket to the waste bin to ensure public safety.

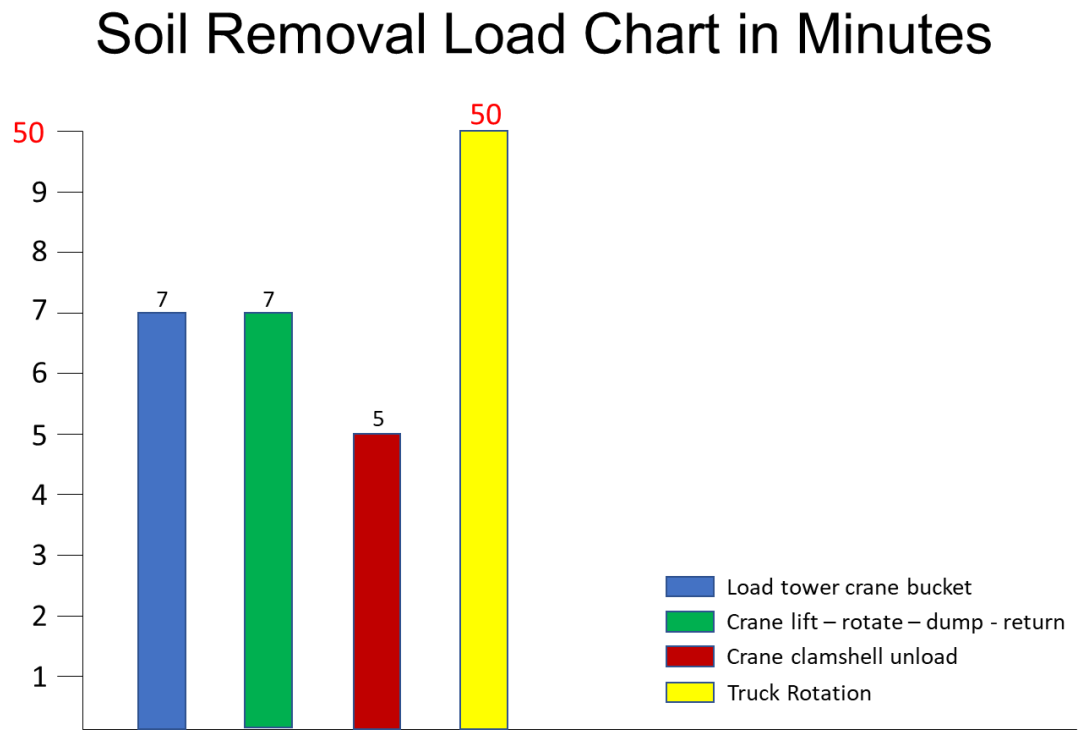
The Lean team placed a lean team member at the excavation site to observe and time the process of digging up the soil and moving it to the holding area. Another was placed at the tower crane shaft to observe and time the loading of the bucket and the amount of time the bobcat operator waited for the empty bucket to return. Another was place on the roof of the building to observe and time the tower crane operation, and another was placed with the bin loading crew on 4th avenue.

The Lean team again quickly discovered that the truck rotation process was the constraint. Using standard time observation forms the Lean team established these key data points:

1.	Loading tower crane clam shell bucket	7 minutes
2.	Crane lift – rotate – dump – return	7 minutes
3.	Crane clam shell unload at street level	5 minutes
4.	Truck rotation – too much variation	Unmeasurable

They also found variation in several other places. Crane operator availability, trucks traveling together rather than staggering start times, and trucks arriving to pick up full bins without empty bins to replace them.

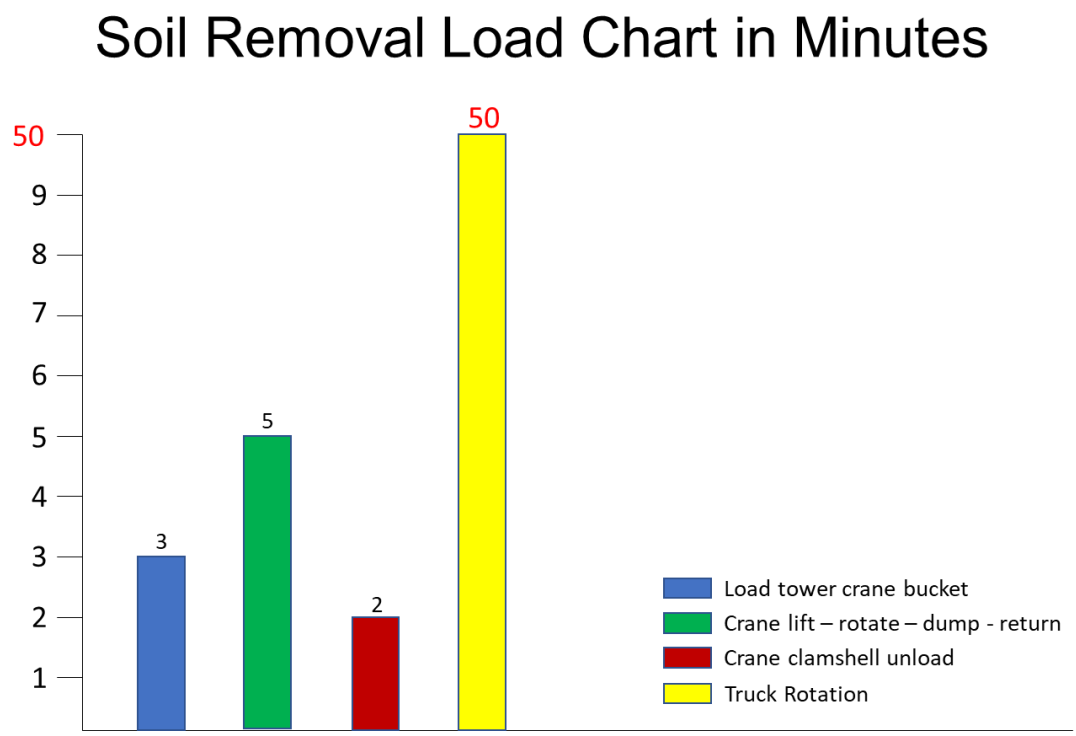
Notes from the Lean team for the first four days of observation;
Monday – 0 dumpsters, crane operator arrived 3 hours late, crew sent home.
Tuesday – 2 dumpsters filled, 2 dumpsters delivered. One truck in rotation. Morning delay 4 hours, that was a 2 hour delay waiting for a truck, when that truck arrived to pick up the full bin, he did not have an empty. He had to deliver the full dumpster to be emptied, then bring the empty back – that was 2 hours.
Wednesday – 3 dumpsters filled, 3 dumpsters delivered. One truck in rotation. First delay 20 minutes for steel pick, second delay 2 hours waiting for truck, 3rd delay 1 hour waiting for truck.
Thursday - Two trucks in rotation for part of the day. Two line stoppers today, the first was 40 minutes as the crew had both bins full and were waiting for the first truck to return from delivery and second was 30 minutes waiting for the next empty bin to arrive.



The soil removal load chart above demonstrates the trades ability to achieve a 95 minute bin rotation. 7 minutes of loading tower crane bucket + 7 minutes of crane lift – rotate – dump – and return and 5 minutes to unload the crane clamshell. Since the clamshell bucket holds two yards of soil and the 20 yard dumpsters could only legally handle 5 clamshell buckets due to weight restrictions, the formula looks like this; $7 + 7 + 5 = 19 \times 5 = 95$ minutes.

Since this process only allows for a maximum of 5 truck loads per day, the Lean team decided to apply process improvement tools and methodology to improve process output. One member of the team worked with the bobcat operator assigned to loading the clam shell bucket. Using value analysis tools, the Bayley Lean team member helped the bobcat driver improve his efficiency through a process known as PDCA, or Plan Do Check Act. This process is also known as Fail Forward Fast. The Lean team member watched and timed the steps of loading the clam shell. The driver and the Lean team member would then review the timings and evaluate which steps were value added and which were non-value added. The driver made adjustments and the Lean team member would again time the process to see if the adjustments actually reduced waste and improved value. After 4 hours of process analysis, the bobcat driver was able to safely load a bucket in just under 3 minutes.

Simultaneously, while the Lean team worked with the bobcat driver, another Lean team member worked with the loading crew at street level. This crew was also at 7 minutes to guide and unload the clam shell bucket into the 20 yard truck mount waste bin. The same process was applied and this team reduced enough waste from the process to safely complete their task in 2 minutes. The crane operator followed a similar process and reduced his time to 5 minutes.



The improved process equation is: 3 minutes to load bucket, 5 minutes of crane rotation and 2 minutes to unload soil into the dumpsters. Or 3 + 5 + 2 = 10 × 5 = 50. The process now has the ability to keep pace with the optimal truck rotation process. At 50 minutes per rotation, and after subtracting start up and break times, the process capability has improved to a potential 8 loads per day. This again from an average 2 loads per day. Effective management of the truck rotation process would have allowed for the goal of 8 loads per day, however, the demolition foreman was delighted with the improvement from 2 to 6 loads per day and declined the offer to optimize the process further. The cost savings generated are difficult to establish, but it would not be a stretch to say that this team saved the job many hundreds of thousands of dollars.

RFP Case Study Request
RFI - Professional Consultant Process Improvement
Trade/Consultant Partnership
Bayley Construction, Macy's Project, Seattle WA.
August, 2016

Engaging professional trades in the Lean for Construction process
Case study; RFI process improvement through Lean application
Bayley Construction, Macy's Downtown Seattle
Design/Build – Seismic Upgrade, Remodel

The Bayley RFI process, prior to the application of Lean tools/methodologies followed these industry standard steps. The request for information is initiated by a trade in the form of an email, sent to the project engineers who fill out the formal RFI form, then email to the architect/engineer (consultant). The consultant reviews the RFI, then sends a response to the initiating project engineer. Often, questions arise requiring further clarification. This process commonly requires several emails, spanning several weeks as each party seeks to clearly define the request/response.

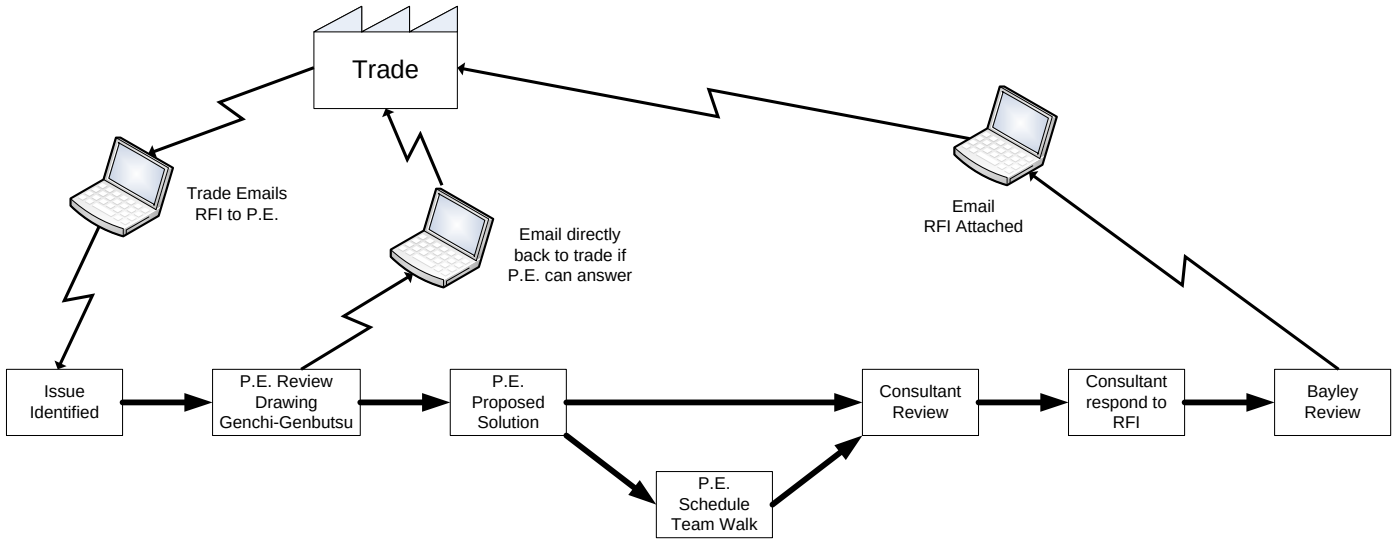
Bayley applied a Lean tool called "value stream mapping" to analyze and improve the RFI process. As with all Lean processes, key stakeholders are an integral part of the process improvement team. The senior architects and engineers along with the Bayley project engineers outlined the current process, seeking opportunities to remove waste, allowing the "value added steps" optimal flow.

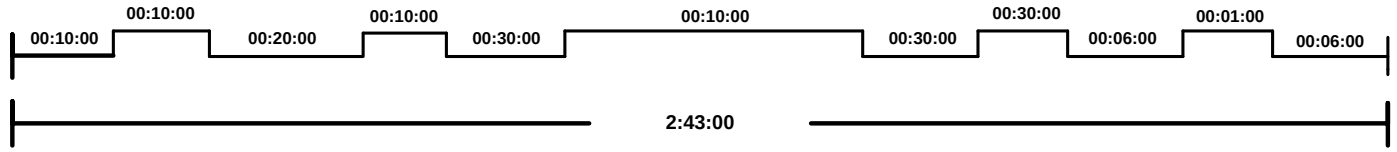
The improved RFI process significantly increases process outcomes while reducing overall lead time by approximately 75%. This was accomplished through the collaborative application of Lean methodologies including "genchi-genbutsu", or go to the actual point of work, with the affected trades, and look at the issue together. The application of genchi-genbutsu virtually eliminated the redundant emails, formerly seeking further clarification of the issue in review. Rather, the team armed with the drawings, walks to the "on-site point of review" to discuss the issue at hand, brainstorm potential solutions, and in many cases, sign the RFI on an ipad, in real time, on the spot. The team refers to this process as a "confirming RFI". The ultimate goal of the confirming RFI is to sign it as complete, the moment it's created. Incorporating genchi-genbutsu, has resulted in reduced emails, reduced lead times, and much more robust solutions through the application of on the spot issue review by all key stakeholders.

Note – the architects and engineers were an integral part of the RFI process improvement team. They felt ownership in the outcome and offered "same day response" for emergency RFI's. They made it clear that they were making this offer due to the amount of reduced effort and confusion inherent in the previous process.

RFI Value Stream Map

Bayley Construction August 2016





Data Box

VA	01:42:00
NVA	01:01:00
VA%	63%
NVA%	37%
CT	01:42:00
LT	02:43:00

The confirming RFI process has saved an untold number of days resolving issues critical to project task execution. Special recognition goes to Bayley project engineer, Nick Boydston, who stepped up to the team at their first walk through with his ipad, and asked if the Architect and Engineer would be willing to electronically sign the RFI that he had just written. At that moment, the confirming RFI process was established.

5S & Kanban

Case Study 5S & Kanban
Tool & Supply Organization
Bayley Carpenters & Laborers
Bayley Construction, Macy's Project, Seattle WA.
Design/Build – Seismic Upgrade, Remodel

Organization, Management and Maintenance of Tools & Supplies

The Bayley team performed their first RPIW, Rapid Process Improvement Workshop in June of 2017. The scope of this event was to organize and manage the tool and materials management processes incorporating 5S and Kanban. The focus was on the tool & materials storage areas located on the 6th and 7th floors of the Macy's building. An RPIW event is executed in two parts, a data collection week followed by the event week. The team is made up of a sponsor, team leader, sub-team leader, process owner, subject matter experts, a KPO representative and the participants themselves, the carpenters and laborers. This team of 10 members spent the first week of the 5S/Kanban process, collecting data pertinent to the optimization of tool and materials management.

The 5S team started their data collection process by building a current state value stream map for tool ordering and return. They traveled to the main tool yard located approximately 20 minutes from the Macy's location. They reviewed with the yard manager, the process for ordering and returning tools. During this process, they discovered that the tool budgeting process, worked against the concept of returning unused tools. Especially those tools which may again be required on the job in the near future. The tool budget process, in general charges each job for the tools they order. Since the yard was established as a profit center, the tools are rented out to each job until the purchase price for those tools is fully recovered. Usually three months. If the team does not require the tools they have purchased, they return them to the yard with no cost recovery. If they require those tools again in the future, they must pay for them again.

Another part of the 5S team discovered that, on average, tool costs on past Bayley jobsites, exceeded the budget by 400%. Upon further analysis, the team discovered some 4,000 items had been ordered and delivered from the yard to the jobsite over a 12 month period of time.

The 5S team spent the rest of the week identifying and locating all the tools on the jobsite. They followed team members to discover the path of travel to retrieve tools, the average number of times per day a carpenter or laborer left their work area to obtain tools, and the number of hours on average that it took to obtain tools.

Armed with the proper data, the team was ready for their 5S event week. Following is an overview of the results obtained during that week.

5S Event Overview:

On Monday, the first day of this 5 day event, the team reviewed the 5S and value stream mapping process, They traveled to the central tool and supply yard in Factoria to experience first-hand the process of ordering and returning tools and supplies. The team returned to Macy's to document the process through the incorporation of the current state value stream mapping process. They then created the future state value stream map, which revealed the 5S process as the proper starting point to attain that future state.

On Tuesday, the team completed their value stream mapping exercise through an analysis and review of the issues discovered during the data collection phase. They added the Process Quantity Analysis (PQA) data to the value stream map and started the 7 ways exercise. Each member of the team created 7 different and unique solutions for each of the issues identified. They presented those solutions to the group, explaining the thought process behind each solution. Once all ideas were presented the teams grouped those ideas by category. The team leader presented the categories and each of the team members voted for the top three ideas. These solutions were then added to the future state value stream map as the next events the team selected for further implementation of the Lean Transformation. On Tuesday afternoon, the team took a deep dive into 5S training, then went directly to the jobsite to implement the first of the 5S's, sorting. The two areas selected for 5S implementation were the 6th, floor tool room and the 7th, floor tool room. Both locations include both tools and supplies with the 6th, mainly supporting laborers and the 7th, mainly supporting carpenters. The sorting exercise removed approximately 144 cubic feet of garbage, recycled 28 items back to the yard, and improved tool room storage utilization by 168% in the 6th, floor tool room and 64% in the 7th, floor tool room.

On Wednesday, the team completed the sorting exercise, then moved on to simplify, the second of the 5S's. Before the team could begin the organization of the tools, they needed to agree on the layout for each room. The 7 designs process was incorporated to maximize the creative input from the entire team. Each participant created 7 drawings of each tool room. They presented these drawings to the group and explained the advantages of each design. They then grouped the designs into categories of similarity and voted for the top design. The votes for both designs were unanimous and as a surprise outcome, the group voted to create a tool cart process for the carpenters to mobilize and organize their tools and supplies at the beginning of each shift. The group then went to their respective areas and began to build out their designs. Carts were purchased to support the carpenters, and the teams went to work allocating the standard set of tools required for each cart.

On Thursday, the teams continued with the simplify process and moved on to the sweep process, the third of the 5S's. Both rooms were starting to take shape with each and every item receiving a designated location. All items were labeled, including the specific tools assigned to each cart. While the teams were setting up the tools required for each of the 30 Bayley carpenters and laborers on site, they discovered that they would require some additional equipment to fully tool up. Those items were procured, labels were applied to each tool designating the cart they were assigned to and the carts were assigned specific locations inside the tool rooms. The team rewired the 7th, floor tool room with its own spider box and procured several power strips to support the chargers for all the radios and all the hand power tools. One of the teams on the 7th, floor, compartmentalized all the larger power tools into a

gang-box. Each tool receiving a designated permanent location. Lifting straps, safety harnesses, power chords, etc. all received specific assigned locations. The 6th floor team arranged their tool room much the same way, but took on the added task of designating locations for the ladders, tippy carts, and some of the higher usage supplies.

On Friday, the teams began to finish up the sweep process and took on standardizing, 4th, of the 5S's. The created standard work for each tool room as well as the carts. They captured those processes on the standard work forms and created the multi-skill training check sheets. We reviewed the 4 key components of the training process (TWI) then began to work on the afternoon report out.

Following is a review of some of the more important accomplishments from the weeks events:

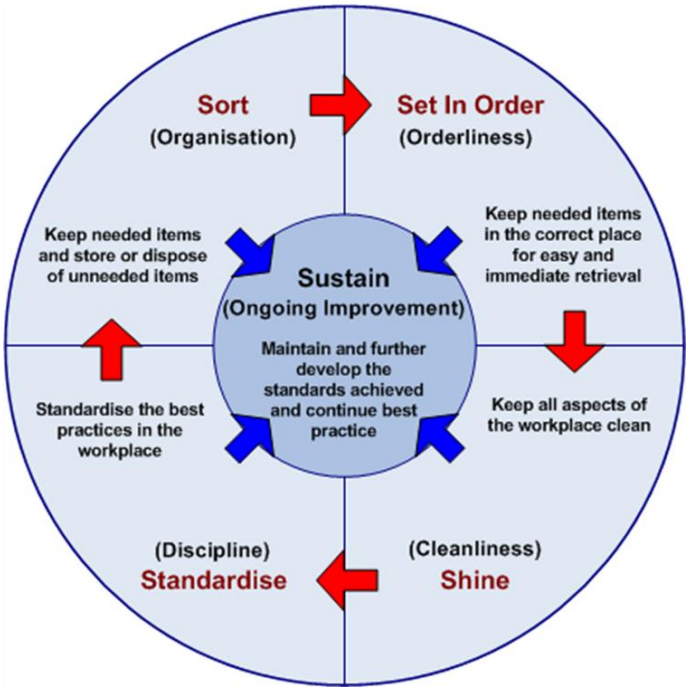
- Travel time significantly reduced, about 20 miles total per day (2/3 mile per person) to search the site for required tools (this does not include materials/supplies travel time)
- All tools on site have a location, they are returned to that location when not In use, available for the next requirement
- Carts were procured and organized for the carpenters, supporting the effort to gather tools and supplies once a day
- Each cart was set up with the standard tools required for each carpenter to perform their daily work
- A job box was set up and compartmentalized for all larger hand tools. These tools can be added to the carts when needed, without searching the site
- All the cart tools have been labeled with their corresponding cart number – no more guessing when a tool is missing or who was in charge of that tool when it went missing
- All radios were organized and labeled, revealing a shortage of radios short term, extras have been ordered – radios are placed on chargers at the end of each shift
- $8,500.00 worth of unneeded tools were returned to the yard. This will make these tools available to other job sites, without a capital purchase requirement

Approximately $1,500.00 per day in labor savings due to reduced travel time searching for tools (supplies not included). Just to clarify, this number rolls up to $7,500.00 per week, $30,000.00 per month, **$360.000.00 per year**.

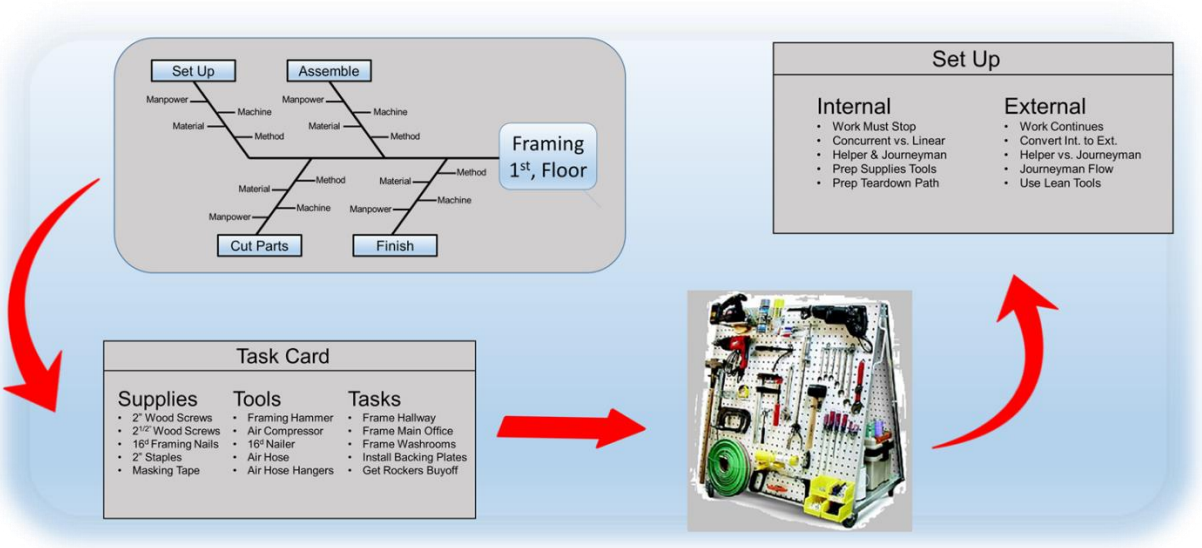
The Kanban process is in its beginning stages, however, it has the potential of equal or greater impact on the availability of manpower through the reduction of parts shortages, material accessibility, and the amount of travel required by Bayley team members when locating and obtaining materials. The kanban process will be part of the phase 2 Lean proposal.

5S

- Sort
- Set in Order
- Shine
- Standardize
- Sustain



Flow of Value



The 5S and kanban processes drive the flow of value on the jobsite. Daily management, to be addressed in the Phase 2 Lean implementation, cannot be optimized until the tools and materials are organized to support setup, mobilization, and access.

Cost Savings Analysis

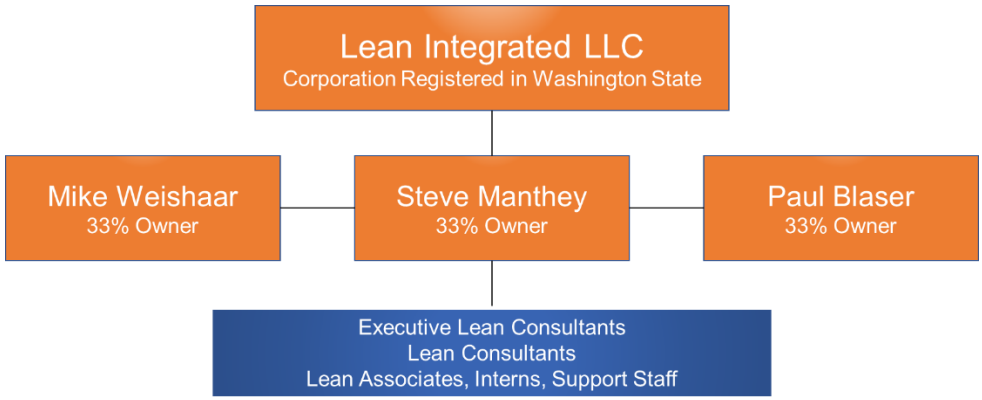
Last Planner Schedule & 6 Week Look Ahead Implementation	$250,000.00
Shear Walls From 2 to 5 Pours Per Week	$250,000.00
Seismic Steel Installation From 2 to 14 Tubes Installed Daily	$250,000.00
Window Replacement Optimization and Paint Color Review	$250,000.00
Demolition Removal Process Optimization	$250,000.00
Soil Removal Process Optimization	$250,000.00
Roof Underlayment Stop the Line on Walk Through	$50,000.00
Confirming RFI Process Implementation	$250,000.00
5S Travel Distance Reduction	$360,000.00
General Conditions @ 3 Months Without Lean Improvements	$900,000.00
Total Lean Process Savings	**$3,060,000.00**

While the above numbers are rough estimates that could easily be disputed. Anyone involved in the process would argue that they are aggressively conservative. We often do not take the time to quantify the bottom line results of our efforts, however, when we do, we can rest assured the effort was worth it. The Bayley team embarked on an aggressive Lean implementation process in the middle of one of the most complex projects in their company's history. The owners sold two more floors of the Macy's building and awarded Bayley the Phase 2 contract uncontended.

Bayley Lean Implementation, Phase 1 Closing Statement

Recognition of Leadership Contribution;
Michael Williams and Wade Meyer for taking the Leap
Michael Williams and Kelley Huestis for their leadership on shear walls and seismic steel
Wade Meyer for his support of the 6WLA walk through process
Nick Boydston for his contribution to the confirming RFI process
Todd Burton for his daily leadership of the 6 week look ahead process
Kevin Krieg for his leadership on night shift supporting the shear wall and seismic steel process
Matt Valasquez for his leadership on the seismic steel walk throughs
Josh Knull for his leadership during the demolition process improvement process
John Marks for his leadership during the 5S, Kanban event
Casey Burr for his leadership during the 5S, kanban event
Sam for his enthusiastic involvement in the Lean optimization projects
Brian Gowers for his enthusiastic support of the confirming RFI process
Manny Golez for his enthusiastic support of the confirming RFI process
The entire Bayley team and their Macy's project sub-trades

Dr. Edward Deming, "It is not enough to do your best, first you must know what to do, then do your best"



Lean Integrated International Inc. is the amalgamation of MTW Consulting, KM Architecture and RBM Architecture to provide advanced Lean Consulting Services to industry and government.

In 2014, building on the successful joint ventures, MTW Consulting, KM Architecture and RBM Architecture formally joined to form Lean Integrated International to provide a full slate of lean consulting services to Canada and Abroad. Based in Saskatoon, we are focused on providing lean consulting services to health care, education, advanced education, first nations and construction clients. Headed by Mike Weishaar, Paul Blaser, and Steve Manthey, our firm is focused on in-depth, practical, solution oriented lean processes that have proven successful for our clients.

In 2015, Lean Integrated LLC was formed to service the many costumers in the US. To accomplish this, Mike Weishaar was appointed CEO of both Lean Integrated International and Lean Integrated LLC. Steve Manthey is President of Lean Integrated LLC and Paul Blaser is President of Lean Integrated International.

Since 1992, MTW Consulting has been providing advanced lean consulting for manufacturing, service, health care, and construction project value streams ranging from $50K to $260M. Clients include Boeing, ADIC Computers, Glacier Bay Yacht Manufacturing, Park Nicolette Health System, Florida Hospital Zephyr Hills, Bayley Construction, Concept Electric and the Saskatchewan Ministry of Health.

KM Architecture has been an architecture and Lean Consulting firm for health care projects since 2004, beginning with Virginia Mason, to Park Nicolette Health System, Florida Hospital Zephyr Hills, and most recently the Saskatchewan Ministry of Health.

RBM Architecture has provided consulting and services at all levels of government, municipal, regional, provincial and federal with a history going back to 1982. Since 2012, those services have included complex and in-depth lean consulting services, working alongside MTW and KM Architecture to provide lean consulting services for the Saskatchewan Ministry of Health and various regional health authorities.

CORPORATE EXPERIENCE, COMPETENCE AND RELIABILITY

The goal of LEAN Integrated is to train and guide our clients toward self-sufficiency in the application of the Toyota Production System tools and methodologies. Our team has successfully realized this goal through the Lean certification of hundreds of professionals throughout the United States and Canada. Upon certification and through the successes achieved as part of that process, these organizations have autonomously continued their Lean journey, earning high accolades among their peer groups.

Members of our team have implemented Lean process improvement initiatives throughout virtually every industry, most notably the transformation of the Saskatchewan provincial healthcare system. Over 3-1/2 years, hundreds of providers earned their Lean certification through adult model training and the application of that training through nearly 900 Lean events

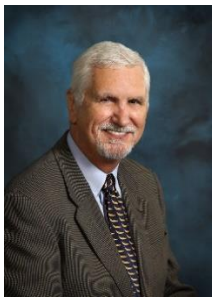
LEAN Integrated Specific Lean Knowledge

Working with companies that are on the cutting edge of the Lean movement such as Genie Industries, Virginia Mason, Boeing, Park Nicolette, Florida Hospital and the Saskatchewan Ministry of Health, our team has the experience and results required to ensure your successful transformation. We have worked in all aspects of the Lean process, from front line operations through executive leader training. We have led study missions to Japan where our clients receive first -hand experience at the source. We have led study missions across the US and Canada including benchmarking projects in support of corporate long term strategy. Our executive team practices ongoing Lean learning as part of our internal continuous improvement effort. In October of 2016 Mike Weishaar co-presented with Mr. Imai (the author of the original book Kaizen and founder of the Kaizen Institute) at the Lean Congress in San Luis Potosi. Our relationship with Shingi-Jutsu, Rona Consulting, the Kaizen Institute and others, allow us direct and exclusive access to the Japanese firms that began the Lean process. We hold dear these relationships with our mentors and sensei's, recognizing the simple truth, they are 5 decades ahead of us. With great humility we seek to understand the highest level goal of Lean "Learning to See". Similar to "Perfection", learning to see can never be fully attained, simply improved daily.

The members of our team hold sacred one of the central philosophies of the Lean process. Respect for people. Dr. Deming described it as "driving out fear". We mention this here as it is key to our mission which includes our goal of "high recommendation" from each of our clients. As Lean is certainly comprised of a set of tools, it is more profoundly comprised of a set of philosophies and methodologies. These philosophies and methodologies must in part be experienced to be learned. Consultants who have not learned Lean at this level cannot teach Lean at this level.

Lean Integrated Executive Team

Steve Manthey



Role: Executive Lean Consultant

Partner, Lean Integrated

Certifications

2010 – Lean Leader, Lean Sensei (teacher) – John Black and Associates

2014 – Lean Advanced Training – Shingijutzu - Japan

An indication of strengths the proposed resource will bring to the project

Steve's total combined 3Ps (Production Preparation Process) to date include 36 projects. 3P is the most advanced Lean Tool, encompassing VSM, Root-Cause Analysis, Change Acceleration Process (CAP), Takt, Standard Work in Process Analysis, Kanban, and others. Of these 36 3Ps, 15 have been in Saskatchewan. Following is a list of projects completed using the lean process. Lean is a tool that works on improving flow and eliminating waste. This process is not specific to medical nor is it specific to constructing Toyota automobiles or Boeing Airplanes. The work completed in Saskatchewan for the Healthcare Ministry is very similar to this project.

MICHAEL WEISHAAR,

Role: Supervising Consultant

CEO Lean Integrated

Certifications

1987 – Kaizen Executive Trainer, Kaizen Executive Leader – Genie Industries

1991 - Master Certification Statistical Process Control (Precursor to Six Sigma) - University of Washington

1997 – Boeing Production System Kaizen Executive Leader, TPM Specialist Leader – the Boeing Company

2009 – Lean Fellow, Lean Executive Trainer and Leader – John Black and Associates

2011 – Lean Advanced Training – Shingijutzu - Japan

An indication of strengths the proposed resource will bring to the project

Learning directly from the Japanese, Mike's early experience with Lean was centered on respect for people. While the tools and methodologies are relatively easy to understand and teach, the philosophies of Lean must be absorbed through good mentorship. These early mentors demonstrated respect for people through their actions and behavior, while at the same time, increased the quality and efficiency of the organizations they managed. Demonstrating for teams this behavior, combined with the Lean tools and methodologies, leads to cultural transformation. In no uncertain terms, this was a gift Mike received early in his career, a gift he endeavors to pay forward at every opportunity.

Paul Blaser

Role: Executive Lean Consultant

Partner, Lean Integrated

Certifications

2014 –Lean Sensei (teacher) – John Black and Associates

An indication of strengths the proposed resource will bring to the project

Paul has led complex value stream mapping, 3P, and Kaizen for various health regions in Saskatchewan multiple departments with integrated current state and future state value stream maps across disciplines. Paul has worked directly with the executive management of the PA Parkland Health Region in this process to support the detailed transition to the envisioned new operating processes at Victoria Hospital in PA.

LEAN EXPERIENCE

- LEAN Consultant – Concept Electric –LEAN construction transformation for 120 person electrical contract at the Saskatchewan Hospital P3 Construction site including Last Planner, 6WLA, Daily Huddles, Daily Site Walks, Jidoka, Fishbone Diagrams, Task Cards, 5S
- Principal LEAN Architect – Swift Current 225 Bed Long Term Care Facility – Data Collection, 7Ways/3P Process
- Principal LEAN Architect – Prince Albert Victoria Hospital –Data Collection,7Ways/3P Process
- Principal LEAN Architect – Saskatoon Cancer Centre –Data Collection, 7Ways/3P Process
- Principal Architect, LEAN Consultant – Nipawin Doctor's clinic– Data Collection, 7Ways/3P Process, Full Architectural Services
- Principal Architect, LEAN Consultant – Kelvington Integrated Health Facility –Data Collection,7Ways/3P Process, Full Architectural Services, Last Planner Scheduling, Fishbone Diagrams
- Principal Architect, Sensei Architect – Saskatchewan Hospital, North Battleford – Data Collection, 7Ways/3P Process
- Principal Architect, Sensei Architect – Swift Current LTC, Data Collection,7Ways/3P Process
- Principal Architect, LEAN Consultant - BUH, ICU, Dialysis Unit, Endoscopy Suite, Chemotherapy Pharmacy Clean Room, Out Patient Recovery -Data Collection, 7Ways/3P Process, Full Architectural Services

ABBREVIATED LIST OF OTHER EXPERIENCE

- Project Architect – U of S Gordon Oakes Red Bear Student Centre Student Centre
- Principal Architect - Wolf Willow Co-housing
- Principal Architect – Prince Albert RCMP Detachment
- Principal Architect - White Butte RCMP
- Principal Architect - Churchill RCMP Detachment
- Principal Architect - Inuvik RCMP Transportable Cell Units
- Principal Architect - North Battleford Youth Stabilization and Assessment Centre
- Principal Architect – Canadian Food Inspection Agency (CFIA) Post Mortem and Lab Renovation

Standard components of the Lean Transformation Model

Strategic Planning

One day event

- Presentation of business structure, goals, current state, Open Square, two hours
- Lean overview presentation, where strategic planning fits in the Lean transformation model, Lean Integrated, two hours
- Strategic planning process overview, Lean Integrated one hour
- Presentation of answers to Lean strategic questionnaire Open Square one hour
- Build 2017 strategic plan two hours, facilitated by Lean Integrated

Logistics Planning

One day event

- KPO set up and training, 4 hours
- Lean room set up and training, 4 hours

Lean Basic Training

Lean basic training provides a one day overview of the Lean process and core methodologies. Participants will be introduced to the history and origins of Lean. They will learn the basic concepts through hands on application workshops. They will see videos of organizations that have benefited from their own Lean journey's. Lean basic training also introduces participants to the Lean certification process. Participants will understand the roles and events required to obtain certification.

Standard Operations

Where basic training provides a one day overview, standard operations provides a deep dive into the Lean tools, methodologies and philosophies. Completion of standard operations is required for all Sponsors, Process Owners, KPO members, Team and Sub-Team Leads. Standard Operations is a three day workshop which includes instruction, videos, hands on workshops and daily participant presentations. This event ends with an open book test. All members of the organization seeking Lean certification must complete Lean basics and Standard operations prior to certification of any module.

Value Stream Mapping

Value stream mapping (VSM) is the initial event required to begin the Lean process in a selected area of focus. This process requires a team leader, a sub-team leader and a KPO representative. Every Lean event requires a process owner and a sponsor who is either the CEO or a CEO direct report. Other members include area team members and client representatives. Value stream mapping is a 5 day event ending with a formal report out. Participants receive training in real time just prior to application. There are three outcomes, 1) the current state value stream map, 2) the future state value stream map and 3) the plan to get from current state to future state.

Rapid Process Improvement Workshop

Rapid process improvement workshops (RPIW) are the engine of the Lean process. Each event requires a team leader, a sub-team leader and a KPO representative. Every Lean event requires a process owner and a sponsor who is either the CEO or a CEO direct report. Each RPIW includes a 5 day data collection process followed by a 5 day event week. Training is delivered daily, just prior to the moment of application. The event week ends with a formal report out. RPIW's are driven from the value stream map. Each RPIW seeks to improve the current process by 50%. The resulting process is supported by standard work and is audited monthly until the process holds green for three consecutive months.

5S Workshop

5S is a process of organization and optimization. Each event requires a team leader, a sub-team leader and a KPO representative. Every Lean event requires a process owner and a sponsor who is either the CEO or a CEO direct report. Each 5S event will span 3-5 days depending on the size or complexity of the area. Training is delivered daily, just prior to the moment of application. The event week ends with a formal report out. The term 5S is derived from the 5 Japanese terms used to describe the organizational process established by the Toyota Production System. They are Seiri, Seiton, Seisou, Seiketsu, and Shitsuke, which loosely translates to Sort, Simplify, Sweep, Standardize and Self-discipline. 5S seeks to dramatically improve area productivity through the reduction of unnecessary items and the optimal placement of necessary items.

Kanban

Kanban is a simplified materials management process. Each event requires a team leader, a sub-team leader and a KPO representative. Every Lean event requires a process owner and a sponsor who is either the CEO or a CEO direct report. Each kanban event will span 3-5 days depending on the size or complexity of the area. A large kanban event, such as the transformation of an entire materials management system may last several months. All kanban events end with a final report out. The goal is to significantly reduce the amount of space, time and dollars spent storing and managing unnecessary inventory.

Mistake Proofing

Mistake proofing is very similar to the RPIW process, with one exception, the event is 100% focused on the reduction or elimination of errors and mistakes that lead to poor quality and lost productivity. Each event requires a team leader, a sub-team leader and a KPO representative. Every Lean event requires a process owner and a sponsor who is either the CEO or a CEO direct report. Each mistake proofing event includes a 5 day data collection process followed by a 5 day event week. Training is delivered daily, just prior to the moment of application. While nearly all Lean processes and events seek to improve by at least 50%, mistake proofing always seeks the complete elimination of errors. Poka-Yoke is the final step of the mistake proofing process. Defined as the elimination of "inadvertent error prevention". The process itself, eliminates the ability to inadvertently make a mistake.

Training Within Industry

Training within industry (TWI) supports the most difficult aspect of any Lean transformation, holding the gains. This five day session includes instruction, supported by projects designed to demonstrate the application of TWI to standardized work. TWI is required for participants seeking their Lean Practitioner certification.

STEERING COMMITTEE

Management support is required to drive this transformation. An executive Lean steering committee will be appointed to lead this transformation. This team will meet monthly to assess progress and to address issues or roadblocks that require attention. A "Lean Room" will be dedicated to the high-level measures required to monitor outcomes. The executive Lean steering committee will hold its monthly meetings in this room, each meeting will require a gemba walk. Gemba is a Japanese term which means "the actual place where the work is performed". One wall in this room will be dedicated as a visibility wall. High level measures will be posted on this wall, providing immediate feedback on project outcomes and process reliability. The Lean Leader will personally facilitate a standing 30-minute meeting in this room each week to receive reports from the leaders of the organization. As with all components of the Lean process, instruction will be provided to the facilitators and leaders who attend these weekly meetings. All meetings and events are structured and timed.

QUARTERLY REVIEWS

Quarterly reviews are held without exception every three months. These meetings are a chance for the KPO and the leadership to see and express the successes and advances made during the previous quarter. The teams present to Lean Integrated, sharing their past, present and future experiences.

In turn, Lean Integrated can us these meetings for coaching as well as trouble shooting. The meetings last no more than four hours and often are a time for great celebration.

LEAN CERTIFICATION PROCESS

Modules Prior to First RPIW (Lean Practitioner)

Lean Basics – introduction to Lean, what you will be learning, workshops
Value Stream Mapping
RPIW Training
5S/kanban Training
Standard Operations
Last Planner Scheduling System
TWI Process Owner/Management Training – Holding the Gains

Level Two Lean Training (Lean Leader)

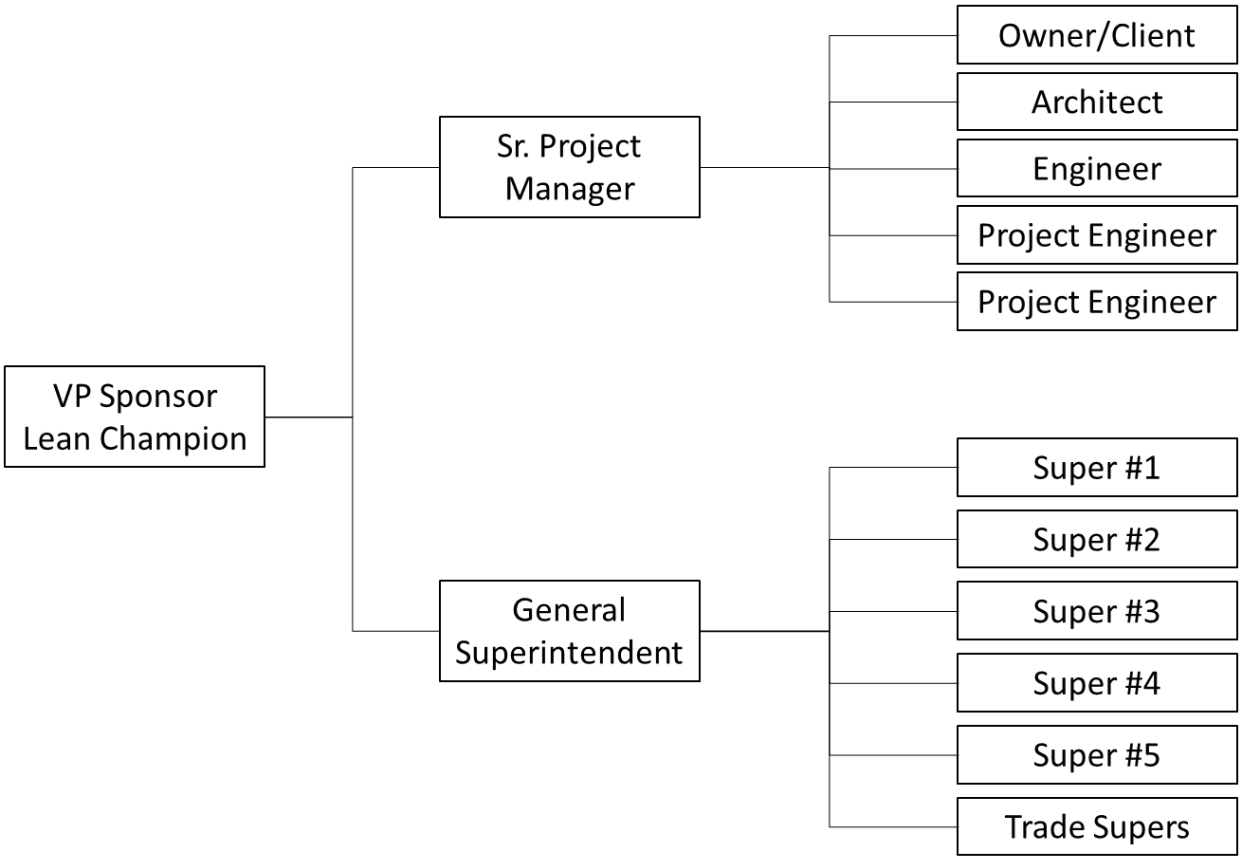
Visual Control
Kanban
Set Up Reduction
Multi Process Operations
Continuous Flow
Process Procedure Quantity Analysis
Mistake Proofing
Jidoka
Total Productive Maintenance

Level Three Advanced Lean Training (Lean Fellow)

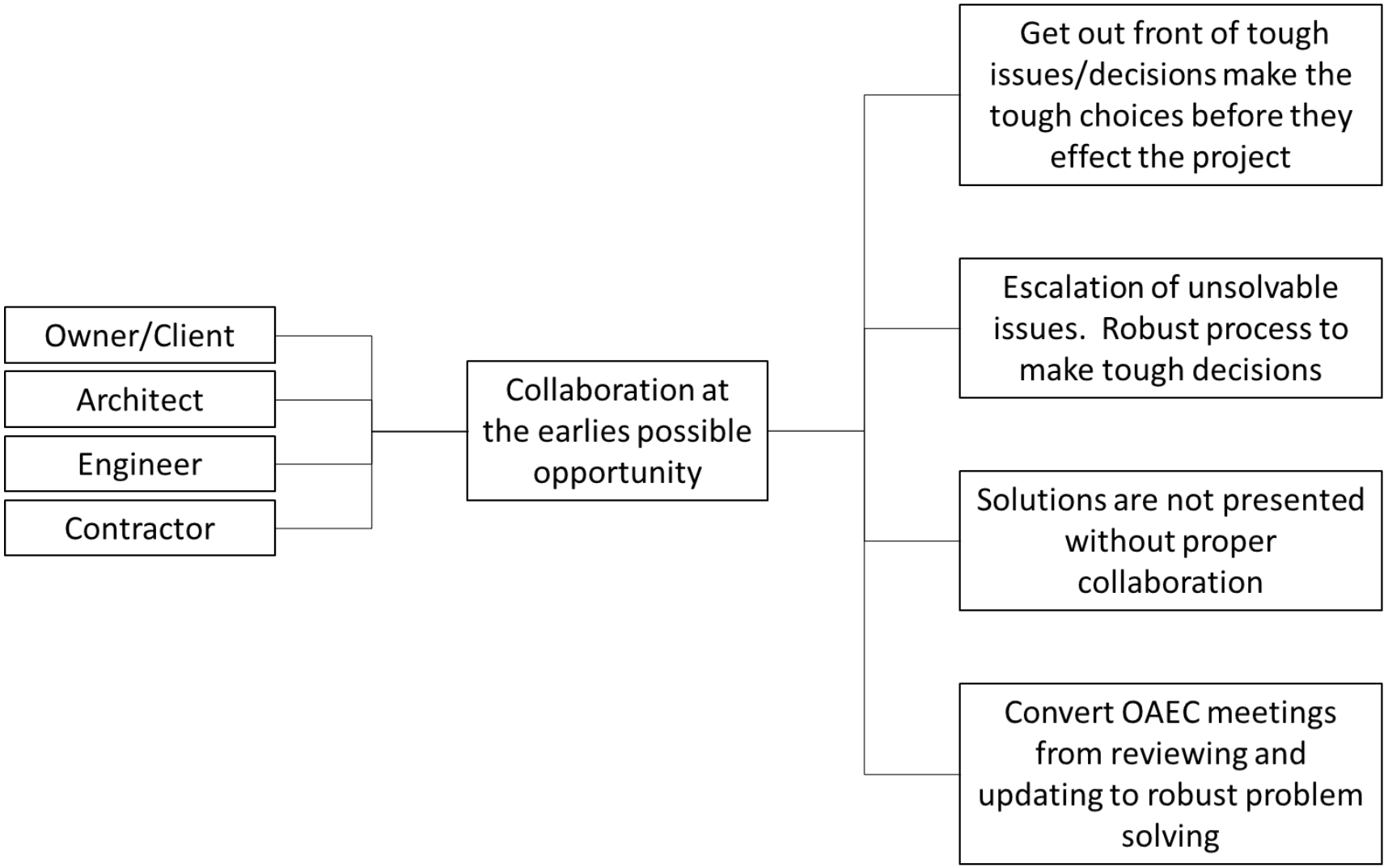
Lean Management Training
Certified Lean Process Owner
Benchmarking
Hoshin Kanri
Measurement
3P
Logistics and Administration
Gemba Walk
Quarterly and annual reviews
Audits
Books and Quizzes
Site Tours
Japan Tour

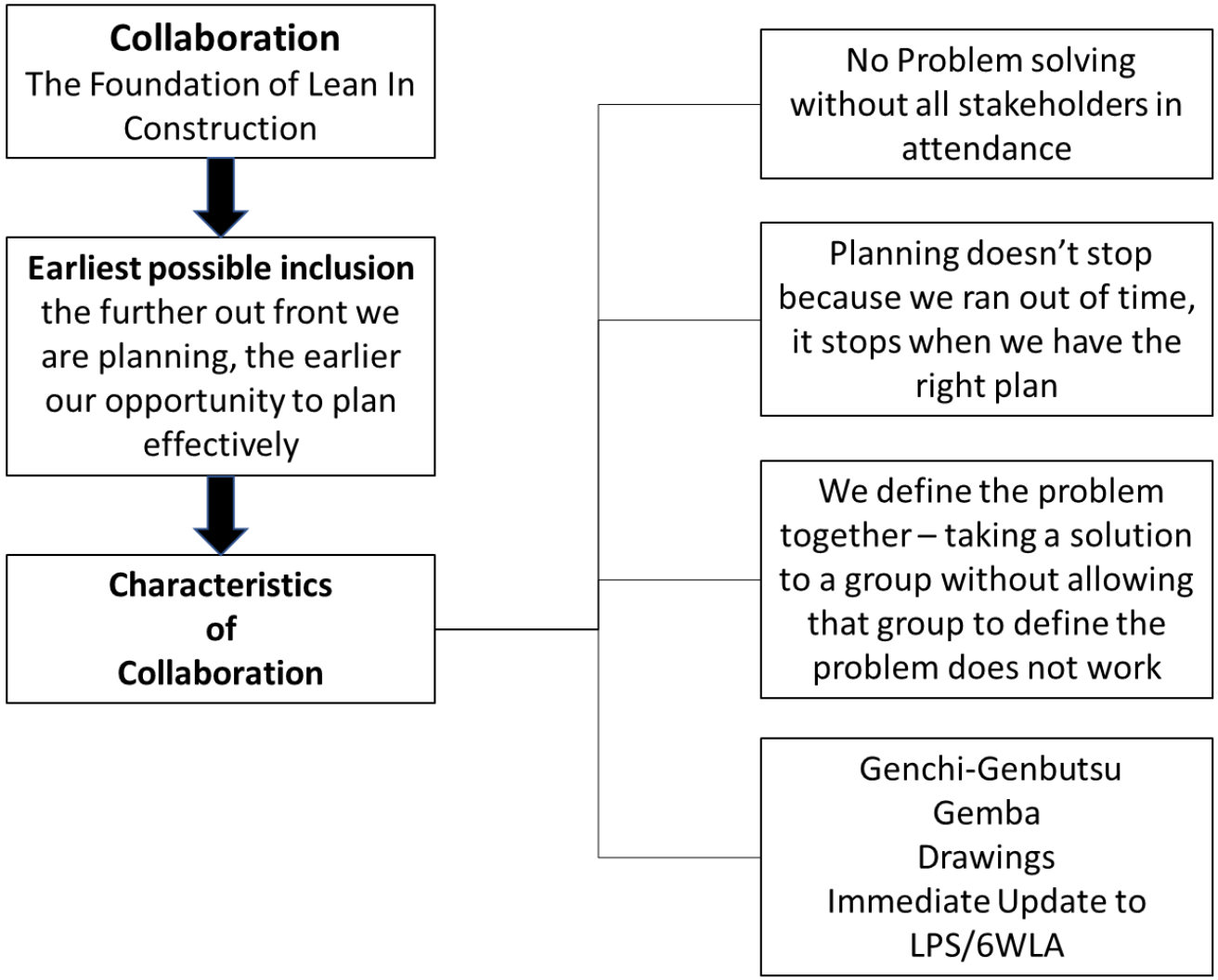
KPO Training

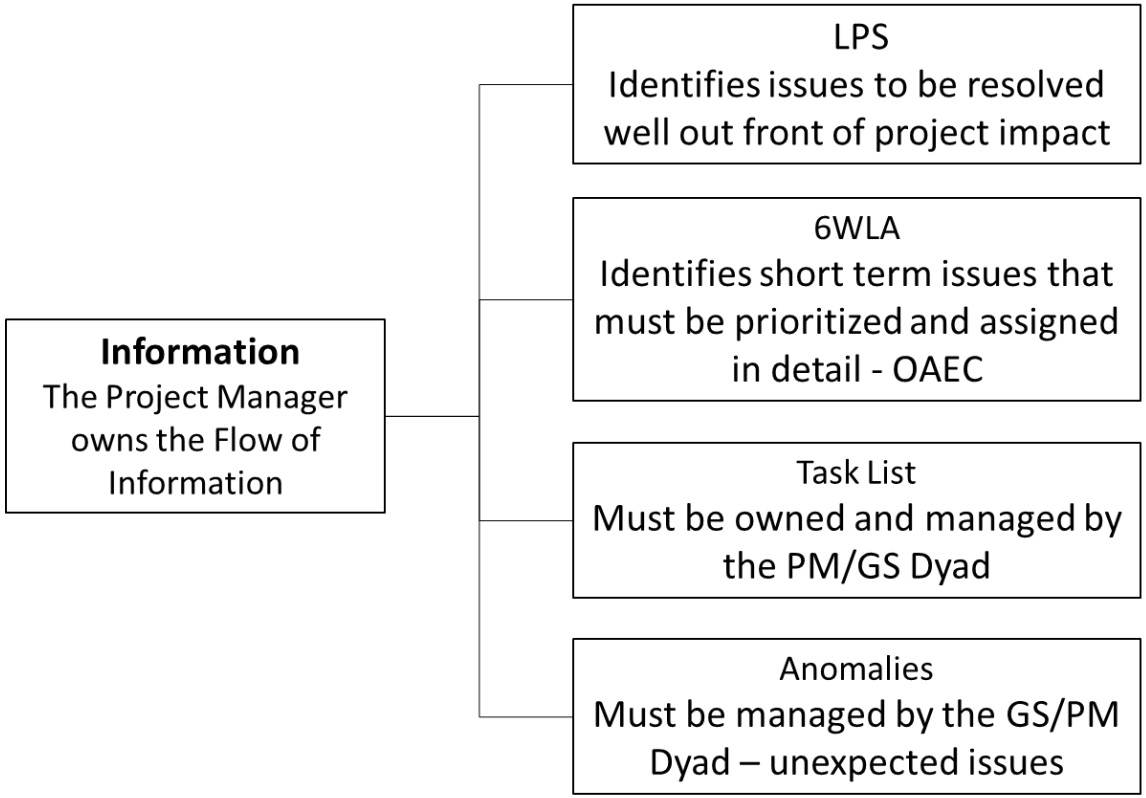
Setting up the KPO
KPO Responsibilities
Managing Information
Rolling up result



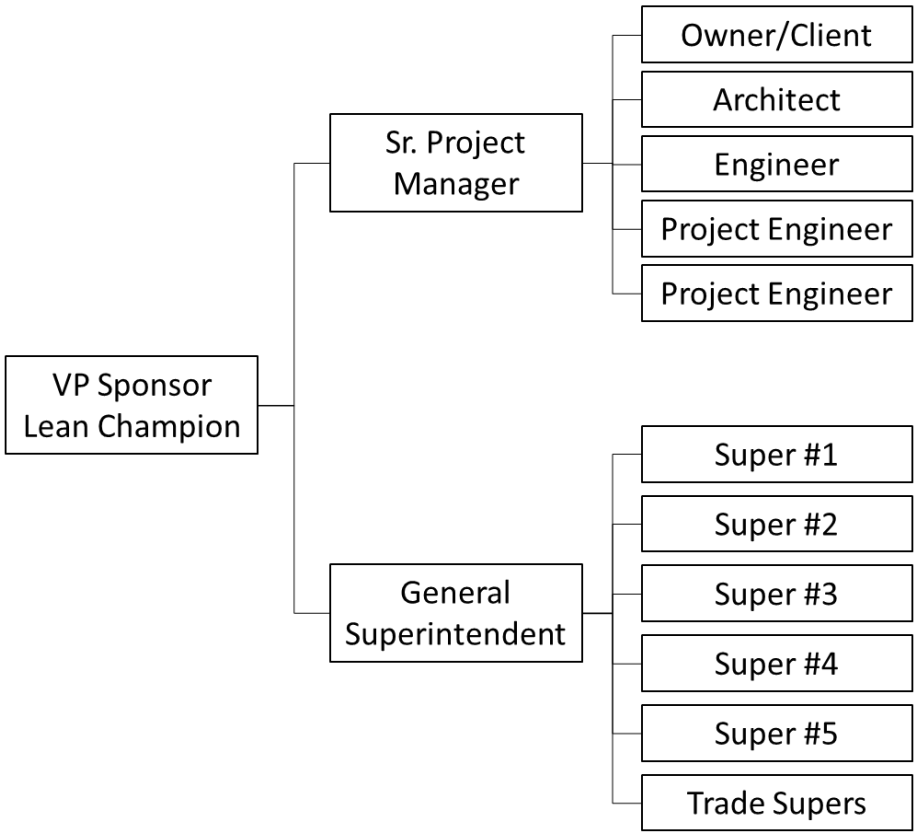
V.P. Sponsor/Lean Champion evaluates progress and effectiveness of the Sr. PM and the G.S. The fundamental goals of the PM/GS are to work together to ensure the effective implementation of the Lean process. PM is responsible for the flow of information where the GS is responsible for the flow of trade/contractor tasks. They must work as a dyad, effectively making decisions as a team, well out front of negative project impact. They must also effectively manage anomalies.


Owner/Client
Architect
Engineer
Contractor
Collaboration at the earlies possible opportunity
Get out front of tough issues/decisions make the tough choices before they effect the project
Escalation of unsolvable issues. Robust process to make tough decisions
Solutions are not presented without proper collaboration
Convert OAEC meetings from reviewing and updating to robust problem solving


Collaboration
The Foundation of Lean In Construction
Earliest possible inclusion
the further out front we are planning, the earlier our opportunity to plan effectively
Characteristics of Collaboration
No Problem solving without all stakeholders in attendance
Planning doesn't stop because we ran out of time, it stops when we have the right plan
We define the problem together – taking a solution to a group without allowing that group to define the problem does not work
Genchi-Genbutsu
Gemba
Drawings
Immediate Update to LPS/6WLA



The Project Manager owns the Flow of Information, where the General Superintendent owns the flow of tasks. The flow of information must include 1) the earliest possible inclusion of all stakeholders 2) all stakeholders define the problem together, not just the solution 3) decision points are clearly defined for all parties 4) information flow is broken into daily tasks just like trade tasks 5) the information flow of daily tasks is included on the 6WLA 6) Genchi-Genbutsu is employed in the information flow 7) the confirming RFI process is employed without fail



All Tasks Specifically Assigned from this list to the 6WLA

6WLA										