CHAPTER 1

LEAN CONSTRUCTION OVERVIEW

Introduction

Lean/Integrated Project Delivery (Lean/IPD) is a response to customer and supply chain dissatisfaction with the results in the building industry. Construction labor efficiency/productivity has decreased while all other non-farming labor efficiency has doubled or more since the 1960s. Currently, 70% of projects are over budget and delivered late. The industry still sees about 800 deaths and thousands of injuries per year. The industry is broken.

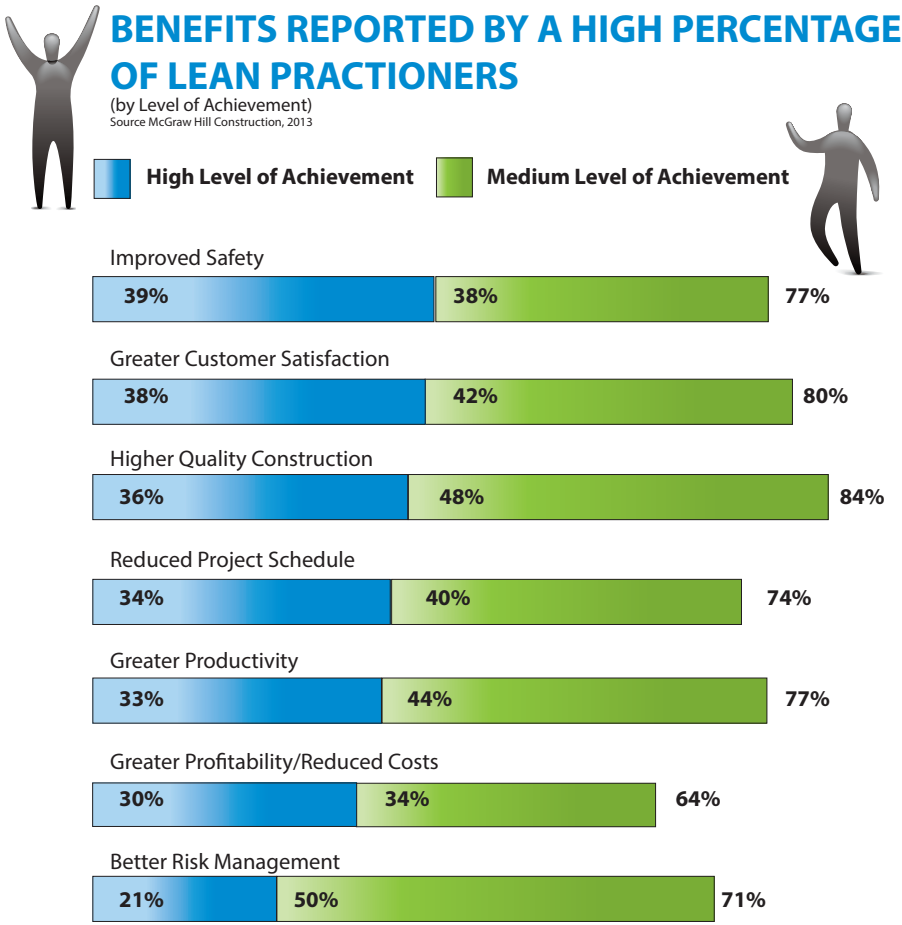
Construction labor efficiency/productivity has decreased while all other non-farming labor efficiency has doubled or more since the 1960s. Currently, 70% of projects are over budget and delivered late.

This is not a construction-only issue; it spans the entire delivery system. The silos created around architects, engineers, general contractors, trade contractors and specialty providers have introduced significant waste into the delivery system. An alarming lack of trust has created systems of checks, double-checks and over specification to cover legal ramifications–either real or perceived.

1.0 Why

Lean/IPD has shown that this phenomenon can be reversed as shown below.

Source: McGraw Hill Construction, 2013



Lean/IPD has the potential to reverse alarming trends in the construction industry that threaten safety, competitiveness and profitability.

Lean construction is a relationship-based system that is founded in commitments and accountability. It significantly improves trust. Teams are integrated through collaborative tools and search for ways to eliminate waste—specifically at the hand-off of work. Teams seek to continuously improve through reflection. Lean/IPD processes are designed to remove variation and create continuous workflow to drive significant improvement in predictability, all while strongly encouraging respect for all people involved.

2.0 How

High-Performing Team selection through a value-based Partner Selection assessment allows multiple subject matter experts to provide their knowledge in new ways through onboarding practices, Cluster Team development, and early incorporation of means and methods. These practices ultimately lead to higher-quality, lower-cost projects. Partners come together in a Big Room environment and learn to function as one team by creating long-term business partnerships. Teams improve by Learning to See Waste through the use of Retrospectives like the common Plus/Delta. Enhanced Facilitation, Agenda management, Production Systems implementation, and the Last Planner ® System are tools that drive productivity into meetings, planning sessions and construction efforts.

Owner/operators are offered a significantly improved Value decision making opportunity and project predictability through Target Value Design. Teams learn to make better decisions with the use of Choosing by Advantages and present better solutions to complex problems through the A3 thinking process.

This framework can be structured through a common contract based around Conditions of Satisfaction that aligns goals and allows all parties to win together—not at the expense of each other—by creating a unique Business Deal.

LEAN CONSTRUCTION OVERVIEW

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CHAPTER 2

THE VALUE PROPOSITION

Introduction

Lean Integrated Project Delivery (Lean/IPD) is a predictable and robust management system that benefits project or building owners and operators. Engaging builders with designers through a non-traditional Partner Selection and Team Forming process enables the entire value stream to be considered. This means that many of the involved participants can offer better opinions, commit to those opinions and perform to those commitments. The availability of this broad knowledge base allows the entire project team to consider life-cycle operating cost, building performance, process outputs and employee engagement benefits to drive optimal solutions from a multitude of solution set options. This broader group of experts brings multiple perspectives to add value to decision making. With real-time cost knowledge, each solution set can be assessed against its impact to cost and schedule, as well as against a pre-defined set of Conditions of Satisfaction.

When builders and designers interact with operators and owners as partners, better understanding and definitions of needs lead to better solutions.

1.0 How

Lean/IPD projects are organized around teams, which eventually include all the key participants in the project–customers and suppliers. When a Lean/IPD project works properly, customers, concerns, new possibilities, value and waste are brought to the fore in new ways–and replace standard practices, historical habits and bureaucratic behaviors. Changes previously considered impossible occur in relationships with suppliers. Previous challenges of managing suppliers disappear and are replaced with collaboration. Task lists are transformed into commitments. People have better conversations and relationships and coordinate with each other much more impeccably. People recover their autonomy, responsibility and dignity. Finally, unprecedented new economic value is uncovered and made available to the participants.

When teams begin to perform well, deeper discussions evolve about building the "right" building for the prescribed need. With subject matter experts representing many areas of the project outcome, coupled with aligned business targets and a transparent sharing of knowledge, a multitude of project systems can be explored and optimized. When builders and designers interact with operators and owners as partners, better understanding and definitions of needs lead to better solutions.

Trust is a foundational principle of Lean/IPD. An owner who relies on the construction industry for regular business growth can expect better outcomes by considering the long-term outlook for partnerships rather than by selecting contractors on a project-to-project basis. By procuring design, build and related specialty services with long-term relationships in mind, the owner can turn the focus from individual company needs to project improvement needs. These partners should be encouraged to speak their minds freely, disagree with the owner/operator and challenge the wants and needs to gain full understanding. They need to be true thought partners, not "yes men." Done correctly, this will lead to constructive conflict, not tacit agreement. This deep engagement can often help the owner/operator improve operations and steer the team to the "Right" building.

By viewing and sharing this risk openly, the team can collectively carry contingency to cover this potential cost.

2.0 Why

When owner/operators engage with experienced partners earlier in the process, a deeper risk assessment and understanding arises. As a result, the team can manage that risk, find a multitude of ways to mitigate the risk, and price it accordingly. By viewing and sharing this risk openly, the team can collectively carry contingency to cover this potential cost. This process focuses the team on finding solutions rather than arguing about who must pay for it, which typically delays solutions, increases the risk, interrupts project flow, and increases cost. The team nearly always has the capacity to address most, if not all, risks as they arise.

Because Lean/IPD projects have built-in schedule predictability, owner/operators can better manage their internal staff and assign them to tasks accordingly. For example, since less time is spent resolving claims and disputes, project participants are available at the planned completion–when they are most needed–and they are able to move to the next business need. With strong team partnership, the project closeout is more organized and reaches conclusion earlier than traditional programs. As teams work together more frequently, individual project vendor staff become extensions of owner/operator staff.

Completed Lean/IPD projects have shown significant safety improvements. Safety is a crucial concern in the construction industry–and Lean/IPD's rigorous planning methods have helped tremendously. Tools like 5S, material management techniques, and other site logistic management efforts make the work safer, thus driving better results.

A word of caution: The owner/operator must be involved in this process to drive success. Value is defined by the owner, and the team needs this definition at every turn of the program. The owner should be open to others' opinions–specifically those of partners who might not be in their primary industry. While at some points it may seem owners are losing control of their programs, they are actually improving control by empowering others to help make the numerous decisions necessary to deliver a successful project.

THE VALUE PROPOSITION

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CHAPTER 3

WASTE

1.0 Why

Studies have shown that about 70% of the activities performed in the construction industry are non-value add or waste. Learning to see waste would dramatically affect this ratio.

Waste is anything that does not add value.

Waste is all around, and learning to see waste makes that clear.

2.0 When

The process to see waste should begin immediately and by any member of the team. Waste is all around, and learning to see waste makes this clear.

3.0 How

Observations

Ohno Circles

1st Run Studies/Videos

Value Stream Maps

Spaghetti Diagrams

Constant Measurement

4.0 What

There are seven common wastes. These come from the manufacturing world but can be applied to any process. They specifically come from the Toyota Production System (TPS). The Japanese term is *Muda*.

There are several acronyms to remember what these wastes are but one of the more common one is TIMWOOD. (T)ransportation (I)ventory (M)otion (W)aiting (O)ver Processing (O)ver Production (D)efects.

Transportation

Unnecessary movement by people, equipment or material from process to process. This can include administrative work as well as physical activities.

Inventory

Product (raw materials, work-in-process or finished goods) quantities that go beyond supporting the immediate need.

Motion

Unnecessary movement of people or movement that does not add value.

Waiting

Time when work-in-process is waiting for the next step in production.

Look for and assess opportunities to increase value through waste reduction and elimination.

Over Processing

More processing than is needed to produce what the customer requires. Perhaps the hardest to detect and eliminate.

Over Production

Making something before it is truly needed. This is a particularly serious form of waste because it leads to other forms of waste.

Defects

Production that is scrap or requires rework. There are many more forms of waste beyond the seven listed. Continue to look for and assess opportunities to increase value through waste reduction and elimination. Some other common wastes that have been identified are listed next.

Underutilized Talent

Many people consider this one the eighth waste. It is essentially underutilizing the talents or resources that are available.

Over Burdening

The Japanese word is *Muri*. This is excessive demand on a system that causes the system to produce beyond its reasonable capacity. Pushing a machine or person beyond natural limits. Over burdening people results in safety and quality problems. Over burdening equipment causes breakdowns and defects.

Unevenness

The Japanese word is *Mura*–fluctuation in demand that causes the workflow to be uneven.

Waste is Disrespect

Waste is disrespectful to people. Any of the wastes described interfere with the environment that an individual works in. Waste consumes resources and skill.

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Respect for People 77

Go to the Work 191

Value Stream Mapping 213

For additional readings and information, please see the below information.

CHAPTER 3 -- WASTE

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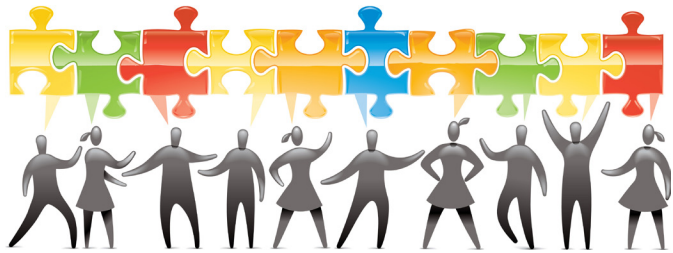

LEAN CONSTRUCTION DEFINED

Introduction

Lean thinking has been applied with much success in many industries and service-provider organization. Lean concepts can be applied to any recurring effort at work, home or play. The construction industry recognizes it needs much improvement to keep pace with the ever-growing complexity of the built environment, and to make progress toward the same efficiency gains other business sectors have achieved. Many believe Lean Construction is the way.

Lean Construction extends from the objectives of a Lean production system—maximize value and minimize waste—to specific techniques, and applies them in a new project delivery process.

1.0 Why

Construction industry studies have shown 50% or more of the effort required to deliver a built environment is non-value added effort, or waste in the eyes of the customer (CII, 2004). The effectiveness of a labor hour has not improved in the last 50 years, while other industries have seen significant advancements (Teicholz, 2004). Demographics and labor shifts have significantly reduced the construction industry's labor availability, and the relative cost increases of the built environment are not satisfying the business needs of many of its customers.

2.0 How

Lean Construction is a respect- and relationship-oriented production management-based approach to project delivery–a new and transformational way to design and build capital facilities. Lean production management caused a revolution in manufacturing design, supply and assembly. Applied to the design, supply and construction of a capital facility, Lean changes the way work is done throughout the project-delivery process.

Lean Construction extends from the objectives of a Lean production system–maximize value and minimize waste–to specific techniques, and applies them in a new project delivery process. Therefore, Lean theory, principles and techniques, taken together, provide the foundation for a new form of project implementation. Building upon its roots in production management, Lean Construction produces significant improvements, particularly on complex, uncertain and quick projects.

3.0 What

Respect for People is the cornerstone of Lean thinking. People transform ideas and materials into final useful value. Respecting the contribution of each individual is necessary to tap this resource. In addition, 1) People are central to the success of Lean project delivery; and 2) The production management-based approach of Lean project delivery encourages all efforts to make transparent and then optimize all processes and flows within design and construction work.

Furthermore, by placing people at the center of Lean Construction, we are reminded to prioritize Respect for People and avoid generating the 8th waste, which can be summarized as "Unused/Underutilized Employee Talent/Creativity/Intellect/Skills/Potential" (Bicheno and Holweg, 2009).

Lean thinking encourages a constant reflection to determine if every expenditure of resource is employed to generate value. The customer should determine and make transparent that value definition via the project's *Conditions of Satisfaction*. to help guide the project team's efforts. Thus, generating value should efficiently transform raw materials into final products or services, and that process should be done right the first time.

Lean thinking encourages practitioners to look for and remove waste. Waste is effort or resource utilization that does not create value. This waste is not always obvious and requires effort to identify and then remove. All waste cannot be removed but an effort to minimize all waste is encouraged.

Lean thinking suggests that standardizing process and leveling flow are the best ways to optimize a value stream. Standardized practices can be repeated consistently and become a starting point for continuous improvement. Leveling workflow helps minimize variation to allow consistent output and predictable results.

Lean thinking demands a mindset of continuous Improvement. Leaders must create an environment where experimentation is encouraged and small manageable failure is acceptable if the goal is to improve continuously. This atmosphere can drive innovation that will benefit the entire value stream through value creation.

An overarching concept of Lean thinking is to optimize the whole. Value stream optimization encourages projects to look beyond the local and individual efforts and study the overall outcome to determine where value is added or waste is included in each step considering the value proposition. This concept is counterintuitive to those trained to specialize in one area and maximize that value. Traditional construction industry contracts force a siloed optimization for each individual firm to be successful. Lean thinking attempts to reverse that concept.

Project teams might also find it useful to customize the way they introduce/initially define changes in the application of Lean Construction based upon the composition of their audience.

For example:

Owner:

- Expects predictable/reliable delivery; that is, on time, on budget, and at the level of quality in a safe working environment expressed in the project's Conditions of Satisfaction.
- Requires actively engaged owner participation to continuously define the value proposition.
- Requires owner representatives to commit to making decisions, sharing the "why" with the partners, and fostering a fair, collaborative environment.
- Expects the owner to be an equally participative, accountable team member.

Design partner: (based upon the Lean principles outlined in *Lean Thinking* by Womack and Jones, 2003)

- Defines value from the customer's perspective and in their language.
- Organizes all value-adding work in a value stream.
- Makes the work flow in accordance with the needs of the next customer.
- Pulls work from a provider whenever possible.
- Pursues perfection; that is, "What can we do to make today better than yesterday?"

Build partner:

- Respects the expertise of the build partners and attempts to maximize their knowledge during design and project planning.
- Focuses on productivity and safety.
- Creates more productive trade partners because all constraints have been removed so they can complete work as planned. This minimizes their comebacks (that is, the need to demobilize and remobilize when work cannot be complete as planned), which negatively impacts productivity.
- Produces better safety results among trade partners because work can be completed as planned. When trade workers perform comeback work, they are potentially double- and triple-exposing themselves to unsafe work conditions.

People are at the center of Lean Construction. They collaborate within and across teams using foundational Lean principles with the goal of optimizing overall value.

Quick Reference

Learning to See Waste 23

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For additional readings and information, please see the below information.

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CHAPTER 5

VISUAL MANAGEMENT & COLLABORATIVE COMMUNICATION

Introduction

Communication is almost always the cause of team breakdowns. Collaborative projects are purposely set up to remove the traditional hierarchy of communication and replace it with a direct network, source-to-source communication style. Even with new technologies and the best of intentions, it is hard to keep all stakeholders informed. *High Performing Teams* have found that dashboards, posters, charts and graphs displayed on the meeting space walls, along with shared technology platforms, drive Collaborative Communication.

1.0 Why

Collaborative Communication is crucial to integration. Collaboration is a relationship focused on a common vision based upon trust and transparency, attempting to maximize customer value through interactive problem solving toward well-defined common goals.

Collaborative Communication, combined with Visual Management:

- Displays a common understanding of project progress in an easily understood format;
- Shows Respect for People by keeping everyone equally informed;
- Eliminates the need for additional reporting;
- Keeps the team aligned and on course; and
- Builds a culture that helps assimilate the ebb and flow of new members.

Visual Management and Collaborative Communication enables the team to promote open dialog, visualize progress, quickly see and address problems that surface, and keep team members informed about the progress of the project.

2.0 How

Teams using Visual Management should first determine what information is needed and what data would be helpful. Additionally:

- Meetings should be scheduled in a visual workspace or where the work is happening.
- The venue should be flexible. Collaboration rooms are valuable to create a team process of how to "meet" and share data.

- The information-delivery system should be continually redesigned and improved. Stale information can be a distraction and should be removed.
- Visual management tools should be designed to encourage people to take action on the hot topics and foster a peer pressure to complete their obligations within promised timeframes.
- Technology should be incorporated to ensure individuals outside the office are tied into the process.

Visual Management information that drives the team includes, but is not limited to:

- Conditions of Satisfaction (COS)
- Schedule Look Ahead
- Budget Management
- Target Cost Tracking
- Cluster Groups Org Charts
- Do More/Do Better
- Personal Comments with Positive Intent

3.0 What

The purpose of Visual Management is to enable and foster Collaborative Communication among team members and encourage additional engagement. Visual Management and Collaborative Communication enables the team to promote open dialog, visualize progress, quickly see and address problems that surface, and keep team members informed about the progress of the project.

More specifically, it enables the team to visualize the system, become aware of any constraints or roadblocks that might result, and begin a dialog on how to solve those problems. In this way, the challenges are directed to the system and how to solve versus focusing on the person as the issue. While there are many methods for Collaborative Communications, several common tools to foster the collaboration

include consensus decision-making, A3s, Daily Huddles and Reliable Commitments activities. An additional benefit for Visual Management is to use the information for reporting project status to senior management of participating project partners.

Opportunities for visually fostering Collaborative Communications are plentiful during a Lean Construction project.

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CHAPTER 6

INDIVIDUAL ASSESSMENT & DEVELOPMENT

Introduction

Teams are only as good as the people who comprise them. A team should utilize individual strengths, cooperate efficiently and effectively, and develop individual skill sets. The first step in being able to do any of these things is to create awareness of traits and skills, individually and across the team.

Assessments optimize team performance by helping each member gain more awareness of his or her skills and preferences, as well as those of other team members.

1.0 Why

Organizations often use assessments for individual development, team building and bettering team dynamics. Assessments optimize team performance by helping each member gain more awareness of his or her skills and preferences, as well as those of other team members. For example, an assessment might reveal that one team member is strong when it comes to conflict resolution. Likewise, another team member might have a high tolerance for change. Knowing these attributes allows the project team to leverage these strengths to the benefit of the individual and the overall project.

The use of Individual Assessment and Development allows leaders to more effectively and efficiently use unique skills to their fullest extent and assemble the right team for the right job, a crucial component for successful project completion. When the right team is in place, the shared learning curve for project members is shorter, an important advantage when staffing projects of shorter duration. Teams that employ this approach also report a higher level of personal and professional satisfaction with projects.

Assessments also can reveal what motivates each team member. Project leaders learn who is more interested in learning and developing as an individual. In this respect, assessments can serve as a longer-term filtering and selecting mechanism.

Team members benefit from the sharing of other assessments as well. They become part of a more effective team, flex their innate personality and have the opportunity to exercise leadership in their area of strength. Armed with greater insight into team member strengths, managers can be more effective mentors and coaches. Assessments might also indicate a particular affinity or interest, the knowledge of which can allow team members to more effectively collaborate. Additionally, it could highlight an area that a team might naturally overlook, thereby providing visibility to alternative perspectives.

2.0 How

An Individual Assessment and Development program can be adapted to fit the unique needs and culture of the organization. There are a variety of tools and resources available, particularly in terms of assessments of social and leadership skills. Some require the help of an expert, such as the Myers Briggs assessment. Others, such as a 360 Review, are easier to administer independently. This should also be considered when it comes to the onboarding process.

Team members who have found value in the assessment process can serve as advocates to encourage others to participate and share their experiences

Here are some available assessment tools:

- Myers Briggs Type Indicator (MBTI)
- Emotional Social Competency Inventory (E/SCI)
- Lumina Spark
- 360 Review
- Thomas Kilman Conflict Mode Instrument (TKI)
- TDF International
- Strengthfinder 2.0 with Core Clarity
- Highlands Natural Battery

Debriefing and application are essential and best facilitated early by an expert and then continuously referenced as a team growth opportunity.

To be most effective, assessment results should be shared among all team members and made visible. The team should spend time learning how they can best use each other's strengths and how to engage each other most effectively.

The next phase of the process is skills development, which is necessary for the team to benefit from the assessment. Several development tools and techniques are available. Here are some of the more popular types:

- Development plans
- Peer network for coaching and mentoring
- Discussion (formal and informal)
- Study Action Teams
- Simulations
- Shared experiences

Potential Pitfall: If there is a desire to use assessments as an aspect of team member selection, it should be done cautiously and as one of many data points that is considered.

3.0 Who

The executive leadership of an organization or project team typically drives Individual Assessment and Development processes. It is important that leaders articulate the value of technical skills, social awareness and personal development. Team members who have found value in the process can serve as advocates to encourage others to participate, share their experiences, and demonstrate the value of the program in terms of professional growth.

Often, the process is integrated with professional development plans and goals.

Assessments can be instituted across an entire organization, at the project level or in the context of a specific team. For example, a team could conduct assessments of all its partners, including designers, architects, engineers and trades on a large multi-year project. It will give all team members the insights needed to improve communication, facilitate problem solving and foster collaboration.

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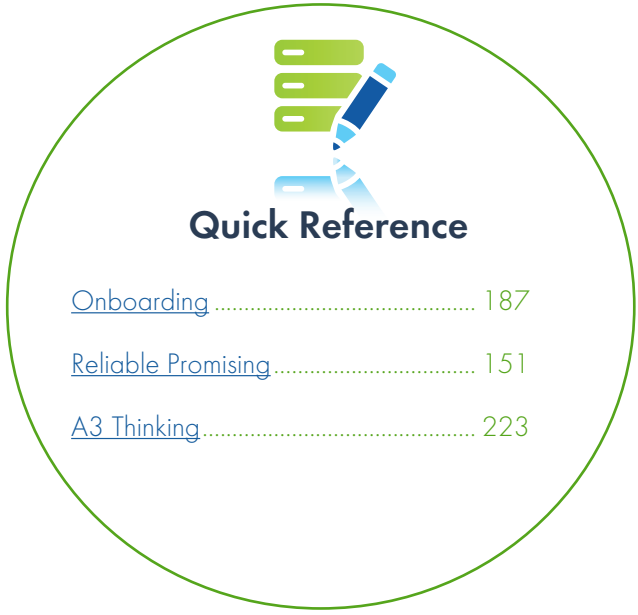

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CHAPTER 7

NOTICING AND DECLARING BREAKDOWNS

1.0 What

A Lean/IPD program encourages stakeholders to plan, design and develop processes that increase value and eliminate waste. It is crucial for team members to understand that all team actions must drive to the desired results. When this is not the case, it is critical for the team to declare a breakdown.

A breakdown is an event that violates or will violate the principles of the project or organization—or erodes team trust.

A breakdown is an event that violates or will violate the principles of the project or organization—or erodes team trust. All team members and employees must be given the authority to declare a breakdown the moment it is identified.

2.0 Why

Projects and processes have challenges every day. When breakdowns are brought to light sooner rather than later, the team has more time to be proactive rather than reactive—and having to clean up a mess. Properly addressing a breakdown can often lead to great breakthroughs and innovation.

3.0 When

A breakdown should be declared by anyone, anytime they:

- Foresee an event that will violate the principles of a project, or organization—or will erode trust;
- Experience an event that has violated the principles of a project or organization, or erodes trust;
- Are confused; or,
- Get results different from what was expected.

Reasons for declaring a breakdown do not—and should not—correspond to the apparent size of the potential violation. Breakdowns may be declared for both minor and major reasons.

If one team member declares a breakdown, it is incumbent upon the entire team to respond appropriately and create shared alignment.

4.0 How

- All employees and project participants must be granted the authority to declare a breakdown. This should be part of all Onboarding plans.
- Breakdowns should be declared to whomever is involved or affected as soon as immediately practical, even if the declarer is uncertain it is indeed a breakdown. This should not occur by email, but in a face-to-face setting.
- Once the breakdown has been declared, the team should prepare for a session to create a shared understanding, identify the root cause, and prevent the situation from recurring. An action plan with ownership should be developed. The method may be a retrospective, a plus/delta, a fishbone diagram, an A3, etc. The method will depend on the breakdown at hand.
- The session should focus on the process or system. Avoid blame pointing fingers.
- When discussing breakdowns, the team must follow the rules of engagement for a safe environment. Nothing should be taken personally and all should understand that everyone did the best they could with the information they had at the time.
- The team should update actions at the daily check-ins.

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CHAPTER 8

TEAM FORMING (KICK-OFF) AND TEAM INITIATION

1.0 Why

While Lean/IPD projects always begin with a collaborative team selection process (Partner Selection), the member firms and individuals involved often are unfamiliar with each other. Lean/IPD projects benefit from a focused effort on team building, dynamics, role definition and vision-casting activities that are repeated whenever a new team is formed, new participants enter teams and whenever there are significant changes in team operations.

Lean/IPD projects are managed by and employ various kinds of project teams–some permanent and some temporary–as a regular part of their operations.

Lean/IPD projects are managed by and employ various kinds of project teams–some permanent and some temporary–as a regular part of their operations. Each Lean/IPD project team is set up for a specific purpose, may have a specific assignment, and will be asked to deliver specific results. Teams are assembled from project participants who may have not worked together previously. Sometimes people not previously involved in a Lean/IPD process may be included in these teams.

Member firms typically come with historical management infrastructure and tools for scheduling, estimating and finance/accounting. Left unexamined, these separate systems may have redundancies, gaps or even be at odds with the project's integrated delivery objectives. Tools, reporting mechanisms and resource deployment must be examined, taken apart firm by firm, and put back together in service of the project objectives.

The Lean/IPD process, the way people work in the projects, the behaviors that are expected, and the cultural styles that characterize the projects are new to most building industry participants. These processes represent a significant paradigm shift from the past experience of most. For example, all team members are asked to provide input when they previously might not have had the authority to speak. Team members are asked to listen to ideas, processes, means and methods. All participants are challenged to drive results that would previously have been considered extremely difficult or impossible.

Project team formation is important in understanding the boundaries of the project and is more than a traditional project Kick-Off. With Lean/IPD projects, team formation does not happen in a single event or meeting; it is developed and evolves over time. There are also multiple purposes to this team initiation: determining design parameters, establishing team behaviors and structure, and developing Conditions of Satisfaction (CoS) metrics that monitor and measure the team's success.

2.0 When

The team Kick-Off is held before any project deliverables are completed and should involve all current project team members. As team members are added, they need to be onboarded. Onboarding allows new team members to understand and respond to current team structure and CoS. It also aligns new team members with the project culture and current team members.

3.0 How

The relationships, operating system and commercial terms of a Lean/IPD project differ significantly different from traditional project delivery. It is critical to inform participants of the new behaviors, tools and transformational change required to be successful in this effort. While no individual concept is complicated to grasp, change is difficult–particularly when it affects behaviors, relationships and previously successful individuals. Kick Off meetings will set the stage for new learning.

Successful teams have learned that the sooner all new team members learn about new behaviors, the better the outcomes. It is quite easy for the original members to forget that they have adopted new behaviors; the original members may expect new team members to automatically have this new knowledge. It is therefore crucial for teams to continue this learning for all new members as they are on-boarded.

Initial Kick-Off discussion topics should include CoS, design vision, team structure and team culture. It is helpful for the core project leadership to write draft or "straw man" concepts ahead of the Kick-Off, which the broader team can edit and improve. It is useful for teams to break out into smaller work groups to advance these concepts, then report back to the broader team about developing objectives, action plans, identifying roadblocks or needs, etc. This transfers ownership to the broader team, advances the initiative, and encourages collaboration and trust building in a learn-by-doing atmosphere. Teams should focus on their team development and broader concepts of success before diving into project details.

The following key points may not be addressed fully in the initial day(s) that a project team forms, but a discussion and plan for developing them should be part of the team-forming meeting.

Conditions of Satisfaction

Develop conditions that will leave all participants satisfied with the outcome of the project. These conditions usually include cost, schedule, community, environment, business objectives, relationship, and profit-based goals.

Design Vision

- Define design parameters in terms of quality and aesthetic direction.
- Identify key drivers to the design–what are elements customer can/cannot live without.
- Identify what value is to the ultimate end customer.
- Determine who makes aesthetic decisions and when they will be made.

Team Structure

- Define roles and responsibilities of team members.
- Define any hierarchy within the team.
- Define decision-making structure.
- Develop an on-boarding process for future integration of team members.
- Develop an effective Big Room.
- Develop a Target Value Design Plan.
- A3 log-Innovation (TVD) ideas.
- Identify risks/opportunities.
- Identify collaboration tools/methods to be used.
- Develop a BIM plan through early discussion, but at the right time with the right team members.

Team Culture

Key Principles

- Transparency
- Trust
- Aligning Minds
- Don't Design Alone

- Develop a learning-with-action/continuous-learning process.
- Norms, rituals, taboos.
- Build trust through intentional interaction.
- Conduct personal assessments of team members to understand how the team members can balance each other.

This initial effort is the groundwork for onboarding all who interact with the team. The more common knowledge and aligned the goals, the better the outcomes for all. The value of this effort cannot be overstated.

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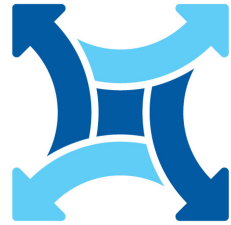
CHAPTER 9



COST FORECASTING FOR EARLY PROJECT PHASES

Introduction

Financial resources, particularly early in the business plan development and validation of a project, need to be carefully monitored and prudently applied. The Burn Rate—the speed at which pooled resources are being used—is a critical factor in a plan's success or failure and must be managed in a meaningful way.

Rather than fix the cost for a preconceived deliverable, it is more prudent to integrate a team of experts to identify areas of uncertainty and continue to develop those to minimize cost risk.

Integrated projects challenge the team to define the best use of this fixed resource pool to resolve outstanding questions, rather than assign fixed contract values to individual providers. The reason? Optimizing value. As work progresses, particularly in its early stages, individuals typically proceed independently toward their own interpretation of the project goals. This can lead to re-work and the unnecessary expenditure of funds, resulting in Waste. The preferred outcome is to increase confidence and clarity toward the Conditions of Satisfaction with the least amount of investment. This approach implies a high level of financial transparency and integration.

Historically, those involved in a project share little meaningful financial information. The individual accounts might be reconciled and balanced, but the actual financial outlook of each is usually unknown to the team as a whole. Shared financial transparency of actual and projected project expenditures during the scope and value proposition phase becomes increasingly important. There are tremendous opportunities within the industry for improving the ability to forecast the cost of a project, particularly during its early stages.

1.0 Why

One of the most important factors when deciding to embark on a building project is the completed cost because the financial success of a project is likely determined by the project team's ability to predict cost accurately and deliver at or below that cost.

Ideally, a team should have a high level of confidence in cost at various decision points in order to make the best informed decisions. This effort requires various levels of input from multiple subject matter experts to inform the development criteria, which in turn informs the size, shape, quality and cost of the program.

Rather than fix the cost for a preconceived deliverable, it is more prudent to integrate a team of experts to identify areas of uncertainty continue to develop those to minimize cost risk. Questions must be asked about operations, such as whether a company could manage with less staff or deliver more value while doing less.

Since funds typically are limited in the early development phases, the focus should be placed upon understanding the project's overall direction in order to decide where funds should be spent. In the early stages, it is important to understand the total funds expended and the percentage of completion so projections can be readjusted. Subsequently, the Burn Rate must be managed from the beginning using monthly projections and actual data.

Participants must immediately recognize waste, be alert to the value of what they are receiving, and take immediate action. To do this, the team must be aware of

each participant's cost forecast to allow the shifting of work to the appropriate party. Additionally, participants should provide adequate insight into how much effort is required for each option, so that value is optimized.

Also necessary when forecasting cost in the early stages are:

- Financial transparency;
- An understanding of how others forecast and account for those costs;
- Immediate awareness of the actual cost to develop; and,
- An understanding of whether value is being delivered proportionately.

2.0 How

Teams should establish a method for tracking expenditures of all participants. Actual labor rate projections for each team member and/or individual effort should be predicted in advance and measured to track performance.

Frequent meetings with monthly invoice reconciliation must be scheduled, with all financial information available in one area for everyone to examine.

Additionally:

- Designate one point of invoice collation each month.
- Display financial and other information in a room for all collaborators to view and match with occasional delivery milestones.
- Show value created through Plan Do Check Adjust (PDCA).
- Emphasize whether the project is ahead of schedule or behind. No news is not necessarily good news.
- Schedule monthly budget cluster discussions. The public presentation of updates helps drive accountability and monitoring of the plan.

3.0 What

While most companies involved in a project have independent tracking systems that produce internal data, such information should be shared. A core group of companies should be formed early to share information and monitor the rate cash is being consumed. This should take the shape of one consolidated budget vs. actual document for all to inform, understand, react to and manage.

Participants must continually consider the cost of each opportunity and make a value decision before spending limited funds.

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CHAPTER 10

FACILITATION

1.0 Why

Establishing a strong team culture is key for Lean/IPD project success. Having a good facilitator on board will help establish and maintain that strong culture. Lean/IPD projects outperform traditional project delivery projects because they are well planned and involve key stakeholders early in the project, thus increasing participant engagement. This engagement can lead to more participants in more sessions than on traditional project delivery projects. Effective facilitation of teams is critical to this success. Facilitate is defined as "to make easy" or to "help something run more smoothly and effectively." An effective facilitator brings out the best in individual team members and the group as a whole by encouraging deep thinking, active participation, collective learning and buy-in from everyone involved. By fostering an environment where ideas, solutions and successful outcomes flow, a good facilitator keeps the team on task so that they produce exceptional results.

An effective facilitator brings out the best in individual team members and the group as a whole by encouraging deep thinking, active participation, collective learning and buy-in from everyone involved.

1.0 How

Facilitator Competencies

An effective facilitator is keenly observant, insightful, and tactful–and has exceptional interpersonal skills. He or she must maintain a productive and safe environment, knows when to lead, when to intervene for course correction, and when to be neutral and take a back seat. A proficient facilitator designs, plans, guides and controls the meeting by focusing on the group process and outcomes, rather than focusing on specific content and opinions involved. A facilitator is not an active group contributor; however, if a facilitator feels it is necessary to contribute to a conversation, it is important that he or she announce they are temporarily "stepping out of facilitator role," make their contribution, and announce when returning to the facilitator's role.

Facilitators should:

- Have strong communication skills.
- Make distributed eye contact with everyone and use participant names.
- Be familiar with the subject manner. (This is not necessary if he or she is able to rely on team members for content expertise.)
- Respect all participants and enable a respectful environment.
- Ask open-ended, impactful questions.
- Listen thoughtfully and paraphrase comments.
- Encourage full participation from all attendees.
- Encourage questions and conversation.
- Demonstrate an energetic and positive presence.
- Be able to connect with multiple learning styles, varied personalities and differing subject matter expertise of the participants.
- Serve the group's objective rather than his or her own personal objective (facilitate, not participate).
- Stay neutral by focusing on the process and not the content.
- Have the authority to confront and stop unproductive conversations and behaviors.
- Manage the room by keeping participants focused, on-task, and on time.

- Create a supportive learning climate.
- Facilitate agreement and manage conflicting perspectives.
- Use his or her voice and body language effectively by:
    - Varying vocal pitch to highlight key ideas
    - Pausing frequently to allow contributions from others
    - Projecting with confidence
    - Using the room to adjust distance from participants

To facilitate an event well, it is crucial to understand the group's desired outcome and the background and context of the meeting or event.

Event Structure

To facilitate an event well, it is crucial to understand the group's desired outcome and the background and context of the meeting or event. Facilitators should think about the process and agenda for the meeting and invest in advanced preparation to take the event through to a successful conclusion. Great facilitation is a group process that flows from an agenda to a conclusion and creates an environment where the group's ideas, solutions, and decisions flow effectively through the event.

Preparation

Things to consider when designing the agenda and event process:

- In what order should the topics be considered?
- How will participants get to know each other? What will be the ice-breaker?
- How will they reach agreement on the meeting objectives?
- How much time will be allocated to each item?
- Will there be smaller break-out groups?

- When will recap and summarize occur?
- How will the meeting plus/deltas be captured?
- How will the event be closed? How will the next steps be determined?

Other things to consider when planning a meeting or event:

- What do participants need to know before the meeting or event? How will this be provided and when?
- What room set-up will best encourage participation? Are separate rooms needed for break-out groups?
- What supplies and materials are needed? (Pens, charts, post-it-notes, projectors, etc.)
- Will refreshments be provided?
- Will participants be given awards or other types of recognition?

Typical Event Format

If deemed necessary, begin the session with an ice breaker event.

Review Event Purpose and Expectations for the meeting.

- Clearly state the purpose of the meeting.
- Clearly state the expectations of the meeting.

Review and Align on Meeting Agenda

- If possible, publish in advance.
- Review at the start of the meeting, adjust if group provides strong input
- Consider asking for hot topics from the participants and how they may inform the agenda

Allocate time for external e-mail or communication and keep that promise (this allows for strict enforcement of the no multi-tasking policy)

- Develop meeting Code of Conduct/Ground Rules (some examples are listed below)

- Stay on Time – this includes start time, end time, break times.
- Safe Zone – everyone is encouraged to speak their mind without concern for embarrassment or ridicule by others
- Behavior – respect for all participants and open discussion among attendees
- No Stripes – everyone has equal status and say in all matters; no one person has more authority than others
- Speak Up – everyone agrees to stay engaged in conversation and share ideas
- Listen to Others – focus on what others have to say and their point of view
- No Side-Bar Conversations – only have one meeting so that opinions can be shared and heard by all (unless designed for break-out sessions)
- Turn Off/Mute Cell Phones – help keep the meeting and participants on track by eliminating phone disruptions
- No Multi-tasking – everyone stays focused on the meeting and shows respect to participants (this includes restricting use of laptops and PDA's)

Define Roles for Meeting Activities

Facilitator – leader/facilitator of the meeting is responsible for the following (or assigning volunteers from attendees), stating their role as "neutral vs. contributor" and as responsible for keeping the session and attendees in balance:

- Scribe – person responsible for capturing the conversation and ideas generated during the event and for consolidating for distribution the group's final decisions and actions.
- Timekeeper/Gatekeeper – person responsible for starting and ending on time, as well as keeping things on track.
- Parking Lot – person responsible for capturing important items that arise in the meeting and are not on the agenda but should be captured for review outside the meeting.
- Guide and control the event to ensure the meeting keeps progressing towards a

successful outcome.

  - Keep up the team's momentum and energy. If energy levels decline, consider taking a short break or stretch
  - Listen, engage, and include all team members. Stay alert, listen actively, and remain engaged (this sets a good example) and focus on engaging others who may be less involved in the conversation
  - Monitor checkpoints and summarize. Control the agenda, share what has been achieved, what's next, and summarize often
  - Intervene only if required (i.e., unresolved conflict, anger, personal attacks)
  - Keep the event flowing and positive
- Watch for and close side conversations
- Know when to end a conversation if it isn't reaching a timely, natural conclusion
- Be on the lookout for people who are not fully participating
- Pay attention to group and individual behavior, both verbal and non-verbal

Summarize, Record and Assign Action

- Review captured outputs of the event and ensure they are understood, agreed upon, and are actioned.
- Develop next steps for owners and due dates on all action items captured.
- Perform Plus/Delta of meeting.

After Event

- Ask a trusted colleague who participated in the event to provide open, honest feedback on facilitation skills for continuous improvement.

Common Techniques

Several simple yet effective facilitation techniques are available and encouraged to advance the flow of the conversation. Some examples (but not limited) are noted below:

- Ice breaker event at the beginning of the meeting
- Using "round robin" to get everyone's participation
- Asking appropriate focusing questions
- Directing the group to take one to two minutes to individually write down ideas or answers and then share them with the group
- Asking follow-up questions that clarify, probe and redirect
- Drawing out clarifications with phrases like "can you say more about that?"
- Rephrasing a participant's point and asking if that's what they meant
- Identifying and verbally summarizing agreements
- Declaring a "lightning round" to generate ideas and re-energize the group

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CHAPTER 11

CONTINUOUS REFLECTION

Introduction

Many in the building industry are familiar with the expression "Just Get it Done" (JGID). It comes from a good place, reflecting a desire among workers, partners and managers to do whatever it takes to complete a job or demonstrate progress and energy. Yet it often results in inferior outcomes as it emphasizes quick action more than deliberative forethought and individual performance over group achievement.

There's a better way, and it's based on an attitude of Continuous Reflection, a leadership mentality that ensures the entire project system is reflected upon as a unit, rather than as individual pieces unrelated to one another.

Projects and practitioners who adopt a mentality of Continuous Reflection have the potential to achieve a greater level of improvement and innovation on their projects and in their work.

1.0 What

Continuous Reflection encourages ongoing improvement in the work process and product. This is largely achieved through regular and ongoing dialog and seeking to foster a genuine respect for the skills and creativity of each partner. It begins with a change in the attitude of management in their perception about results, from one focused on action to one focused on value that is delivered. It encourages partners to exercise experience and thought in how they approach the work so the skills and creativity of teams can be fully utilized.

2.0 Why

Projects and practitioners who adopt a mentality of Continuous Reflection have the potential to achieve a greater level of improvement and innovation on their projects and in their work. When Continuous Reflection is the mindset on a project, the entire design and construction process is optimized to yield better results that are visible in all aspects of a job.

Continuous Reflection is based on the belief that there is value in taking time to reflect on recent performance so teams can avoid repeating the same mistakes and improve on or take advantage of circumstances that went well. Practitioners seek to examine recent performance to identify opportunities to improve the process. Such information comes from asking questions that focus on exploring the problem and examining different solutions, rather than pointing a finger or assigning blame. It represents a shift from "this went wrong" to "how can we improve this?"

These questions are asked in a spirit of respect for the expertise and skills of everyone contributing to the project. It promotes the dialog that allows opportunity for improvement and innovation. This in turn shows respect for people, their skills and creativity, which drives continuous improvement. This means including everyone in the discussions that examine the process and seek suggestions for improvement.

3.0 How

There are several steps leaders can take to foster a culture of Continuous Reflection. First, allow the team members to be empowered to invest in their work by trusting and respecting their skills and giving them space to exercise their creativity, then ask them to be accountable for their improvements through the results they achieve. When beginning this practice make sure to indicate to people your persistent questions are meant to offer improvement opportunity rather than assess blame.

Plus/Delta Lists are one of several tools that can be used during Continuous Reflection.

Pay attention to the use of language. For example, refer to "trade partners" rather than "subcontractors." Along the same lines, ask questions rather than dictate answers.

- What help do you need?
- What is in your way?
- Help me understand why you say that?
- What else is there to learn?
- How can we do it better?

Employ a non-punitive management style. Create a safe environment where mistakes can be opportunities for learning and improvement of the system. For example, if a worker digs in the wrong area, rather than simply having him dig in the right area, try to understand what within the process allowed that to happen. Be equally focused on the process as on outcomes.

Listening is another key skill. Be an active listener who is humble and has a desire to learn from and understand others.

Ohno Circles can be an effective tool for doing the kind of thoughtful observation that supports Continual Reflection. Commit to protracted observations rather than quick walk-throughs. This will help teams develop a more meaningful understanding of the processes, as well as gaining a deeper appreciation of the work of others, which will lead to stronger and more developed improvements.

Other tools that can be useful include the following:

- Plus/Delta Lists
- Regular retrospectives
- Lessons Learned captured in A3s
- OZ Principle
- Daily Huddle
- Milestone Retrospectives

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CHAPTER 12

LEADERSHIP AND LEAN/IPD PROJECTS

1.0 Why

Lean/IPD is a significant departure from traditional project delivery models. With Lean/IPD, participants collaborate to create aligned project goals rather than create individual goals based on transactional agreements. Successfully implementing Lean/IPD requires strong leadership from the project team. Leadership refers to the capacity to produce movement and changes in the behaviors, concerns and cultural styles found in the community of participants in the project. On a Lean/IPD project:

- Project leaders build the ambition that every participant in the project develop leadership skills, to the extent they can.
- Leadership is essential for building the kind of new and unusual cultural environment in which Lean/IPD projects succeed.

If a Lean/IPD project does not have strong overall leadership, the entire project is at risk of reverting to traditional project delivery methods. Alternatively, there may be confusion between old and new delivery methodologies.

Leadership is not management. Management's purpose–to control and maintain stability–is diametrically opposed to leadership's purpose of effecting change. A manager typically keeps matters stable and in control; a leader typically unsettles, destabilizes and provokes team members to consider new opportunities.

Leadership is not management. Management's purpose–to control and maintain stability–is diametrically opposed to leadership's purpose of effecting change.

2.0 What and 3.0 How

Lean/IPD projects function best when many team members are capable of leading. Traditional styles of top-down leadership cannot sufficiently handle the challenges of managing Lean/IPD projects.

Team members are typically brought into a project for their technical and professional expertise. More often than not, though, they lack the leadership skills for managing the complexity and shared responsibilities required in a Lean/IPD project.

The job of leadership is to bring a new future and circumstances, in effect a whole new world in which we are building new ways of working with each other.

Without strong, capable and widespread leadership, the kinds of long-held habits that need to be changed cannot be changed.

In a Lean/IPD environment, the goal is for each team member to lead at some point during a project's duration. With care and attention, each team member can learn to be a strong leader. It is therefore incumbent on project leaders to build leadership ambition in all team members. Eventually every team member will need to respond to–and take responsibility for–project events. This might include leading a sub-team, declaring a breakdown or acting as a technical expert in some aspect of the project.

Some people do not think it is possible to learn to lead. However, experience with Lean/IPD projects reveal that at the very least, many of the most potent leadership skills can in fact be learned by serious students over periods of time. Working in Lean/IPD projects allows team members to learn leadership skills through observation and practice. With appropriate Partner Selection, Team Forming and Onboarding, the team can use these skills to create a High Performing Team.

The fundamental activities of the leader are rhetorical and conversational. Leaders make, seek and clarify assessments; make requests and invite offers; and solicit reliable commitments from team members.

By forming Cluster Groups, leaders empower their team members to take responsibility for all aspects of the project in which they are involved. To do it well, leaders may need to gain support from owners, clients and more senior leaders in the project. Leaders may also opt to get help from those senior to them. The team can also assist by using Conditions of Satisfaction.

Effective leaders know that they must resolve tension from competing concerns. On the one hand, they must invite, encourage and "push" reluctant team members in directions they might rather avoid. On the other hand, effective leaders will continue to listen to all of their team members and learn from their opinions and objections. A strong leader will encourage concise A3 thinking and the use of analytical thinking tools such as Choosing By Advantages.

In Lean/IPD projects, leaders must produce learning environments in which it is O.K. to fail. In the best cases, teams learn to move quickly and not fear failure because they understand that "failing fast" is often the best way to accelerate learning.

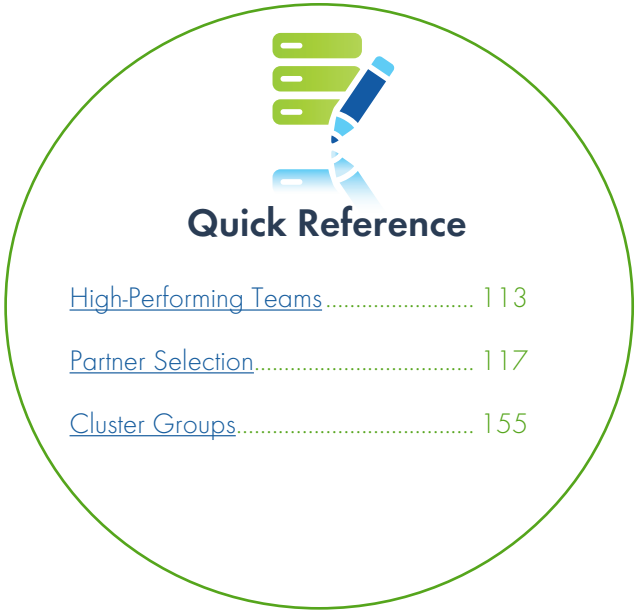
The fundamental activities of the leader are rhetorical and conversational. Leaders make, seek and clarify assessments; make requests and invite offers; and solicit

reliable commitments from team members. They facilitate conversations, and identify and adjust to emerging team concerns. The fundamental skill of the leader is listening to the concerns of the community, and to the possibilities that can be brought to the circumstances in which the community finds itself. Leaders also alter the way that their communities listen so that new kinds of actions and opportunities can emerge.

Power–the capacity to move people in directions that they might not otherwise be willing to move–is a fundamental leadership trait. Good leaders gather authority and power while they work.

Effective leaders are keenly observant and attuned to team members' moods and can redirect a team's emotional energy. Whether a team member is on the brink of resignation or the entire team is energized, focused and enthusiastic, a good leader intervenes accordingly. A strong leader channels positive team energy to create solid Hand-off Work Planning.

Effective leaders–whether they are quiet and reserved, or talkative and gregarious–know how to select team members and get the best from them. They distinguish strengths and weaknesses of team members and know how to motivate them. By respecting their teams, great leaders earn their team's loyalty, trust and respect.



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CHAPTER 12 – LEADERSHIP AND LEAN IPD PROJECTS

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Lean Journey - Lean Transformation of a Company

Lean principles in industrialized housing production the need for a cultural change

Safety - A Lean Transformation

Southern California Owners Forum

The Impact of Path Dependencies on Lean Implementation within a Construction Company - A Case Study

Three opportunities created by Lean Construction (new)

CHAPTER 13

COACHING

Introduction

Interjecting significant change into a collaborative project requires leadership coaching. Traditional projects often are managed in a command-and-control environment and don't take advantage of the expertise offered by all members of the team. When undertaking a different project delivery model, it is necessary to support those involved with additional guidance. A coach can provide that leadership.

When undertaking a different project delivery model, it is necessary to support those involved with additional guidance. A coach can provide that leadership.

1.0 Why

Constantly communicating the Lean vision through formal and informal conversations by a coach inspires and motivates individuals. Through coaching, members can learn better–and best–practices and ultimately become coaches themselves. If a member receives great coaching, that individual is more likely to tutor others when entrusted with formal leadership roles, further spreading the Lean transformation.

Team members need someone who can guide them in implementing transformational thinking strategies and procedures, and a coach can fill that need. A good coach builds upon individual development, as well as responds and adjusts to changing conditions.

2.0 How

A coach often works to a defined objective, training an individual or team toward a better overall understanding of Lean concepts and outcomes while driving teams or individuals toward better performance.

Ideally, a coach should be an individual not associated with specific project requirements, or an outside consultant. Since coaching involves teaching fundamentals and skills, there are various methods at a coach's disposal. At times coaches are teachers, while other times they are guides who provide individual support. Team members should universally agree to have a coach; likewise, a coach should focus on team members who are receptive to their assistance.

In order to help an individual realize goals, a coach might suggest self-learning such as videos, classes and peer support; or specific tools and strategies to help improve current and future performance. Coaching provides an individual with opportunities to develop new skills, as well as advance in their organization and/or personal life.

3.0 What

While teaching new methods in a classroom is passive, coaching is learning in action. By fully utilizing individual skillsets through coaching, collaborative projects can drive significant improvements.

At times coaches are teachers, while other times they are guides who provide individual support.

Coaching is not mentoring. It's about helping people get better at their job. A coach has knowledge that can be imparted, knows how to ask career and procedural questions, and can assist an individual or team in meeting goals.

Additionally, a coach:

- Nurtures a team so it becomes self-sufficient;
- Implements foundational learning;
- Connects with previous projects and procedures;
- Learns to translate past experiences; and,
- Implements, reflects, assesses, and adjusts tools.

"In the business context it can be defined as an informed dialogue whose purpose is the facilitation of new skills, possibilities, and insights in the interest of individual learning and organizational advancement. Best characterized by listening, observing, questioning, joint problem solving and action planning." - Lore International Institute

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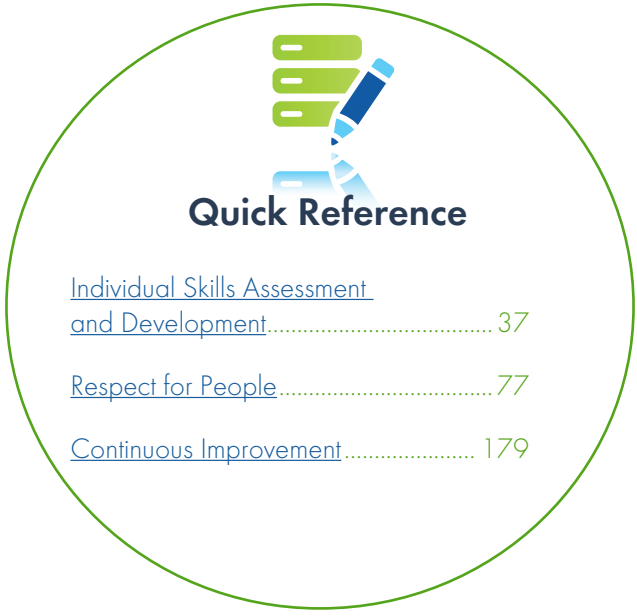

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CHAPTER 13 – COACHING

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5.2 Mechanical Systems

5.6 VDC for Lean Project Delivery A3s

A Lean And Agile Construction System As A Set Of Countermeasures To Improve Health, Safety And Productivity In Mechanical And Electrical Construction

A Lean Modeling Protocol for Evaluating Green Project Delivery

Alliance Lean Design Construct on a Small High Tech Project

BIM and Value Stream Mapping Robert Mauck

Commercial Terms to Support Lean Project Delivery

Contract Or Co-Operation Insights From Beyond Construction Collaboration - The Honda Experience

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Five Big Ideas of Lean Construction

Integrated agreement on one page

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Transitioning to Integrated Project Delivery Potential barriers and lessons learned

Why Isn’t The UK Construction Industry Going Lean With Gusto

CHAPTER 14

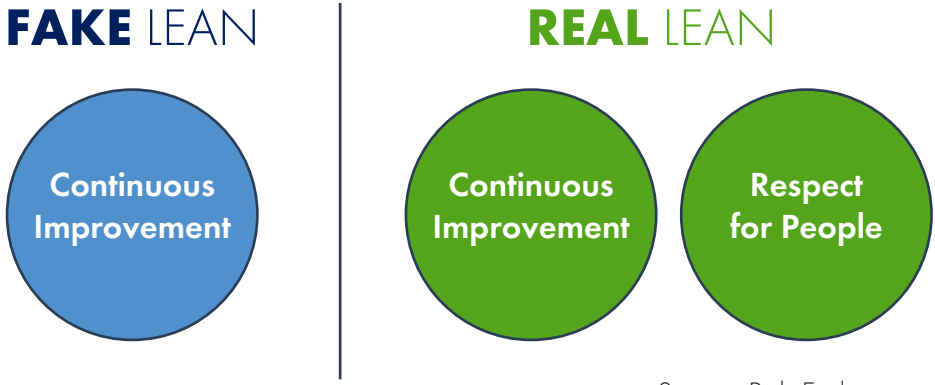
RESPECT FOR PEOPLE

Introduction

Traditional project delivery has generally viewed individual participants as labor or knowledge producers as defined by their narrow specialties. The traditional tendency is to pigeonhole individuals into their capabilities, such as licenses, firms, trades and expertise.

Collaborative project teams have learned that by respecting the individual first, then the role, participants will become more engaged in an enterprise and contribute in more meaningful ways. In fact, through respect, inclusion and appropriate challenges, individuals grow and engage further, produce more and are more fulfilled.

Collaborative project teams have learned that by respecting the individual first, then the role, participants will become more engaged in an enterprise and contribute in more meaningful ways.



Source: Bob Emilani

"Respect for People enables Continuous Improvement. Continuous Improvement does not enable Respect for People." – Bob Emiliani

1.0 Why

Respect for People, together with Continuous Improvement, form the two pillars of Lean management. However, it is the many Lean tools–aimed at making waste visible and improving processes–upon which organizations tend to myopically focus as they attempt to adopt the Lean philosophy. Experience demonstrates that Lean transformations fail to deliver sustainable results without equal attention to both pillars.

Respect for People means:

- Recognizing and showing appreciation for the value of each individual and what they bring to the team;
- Creating and maintaining an environment in which it is safe to speak up with concerns and problems, with the expectation that others will listen;
- Adopting a "problems first" attitude; and,
- Being open to the ideas of others and challenging one another to become better.

Respect is not the same as politeness or conflict avoidance. To the contrary, Respect for People *requires* that we embrace constructive conflict and openly discuss issues that might normally be treated as "undiscussable." Because Respect for People is not always comfortable, politeness can actually be its near enemy.

A Plus/Delta is a simple example of constructive conflict in action. In such a situation, an issue that might be perceived as a negative is instead framed as a delta, or a possible change to make the process better. These issues are openly discussed as a team, and the group decides which actions should be taken.

2.0 How

Place a primary focus on enabling those who perform the value-adding work to be successful every day. Ask them how this can be achieved, then help them to implement their ideas:

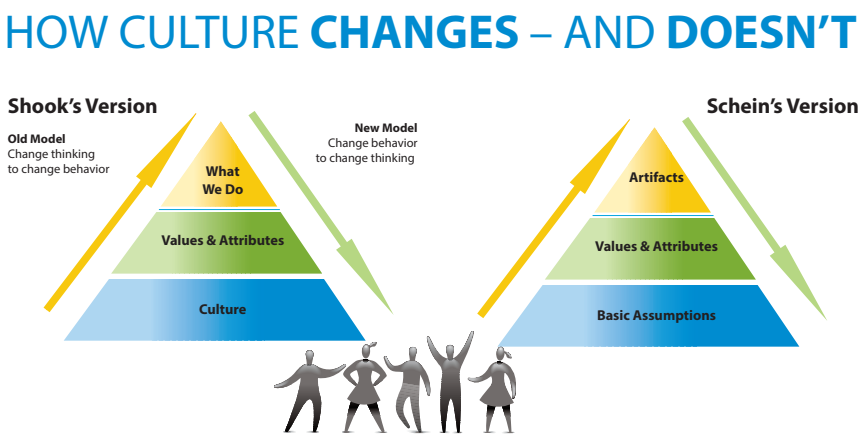
- Solicit broad engagement of each individual and invest deeply in developing that person's capabilities.
- Go to the Work to understand the challenges, determine if help is needed, and offer assistance.

Listen:

- Practice effective, empathic listening.
- Develop emotional intelligence skills.
- "Seek first to understand." – Stephen Covey

Practice humble inquiry:

- Employ strategies for creating a safe environment.
- Adopt "No blame" and "No stripes" ground rules.
- Shift from a stance of "let's get to work" to one of building relationships first.
- Adopt the practice of asking questions about what we don't know and move away from telling and directing.
- Leaders should adopt the practice of being vulnerable and acknowledge their complete dependence upon the team for project success.



Additionally, you should purposefully bring learning and improvement practices into the way the project is organized and delivered. Develop a team culture embracing John Shook's suggestion that, "It's easier to act your way to a new way of thinking than to think your way to a new way of acting."

3.0 What

Lean management is unsustainable without an equal emphasis on both Respect for People and Continuous Improvement. Without equal emphasis on the two pillars of Lean, the process quickly degrades into "Fake Lean."

Proper Lean management takes the view that:

- People are intrinsically motivated. Being effective together calls for connecting with the interests and concerns of everyone.
- People are fundamentally good and have positive intent.
- It is worthwhile to invest in building the capabilities of people for the sake of the project and future projects.
- The objective is not merely to produce improvements but to develop each person's capability to improve.
- Everyone should come to work with the expectation of being successful every day. People should not be overburdened and should have the resources, skills and environment to do their work.
- Leadership is responsible for the system within which people work. When things go wrong, presume the system is faulty rather than blame individuals.
- Respect helps to build trust, which in turn enables innovation and risk-taking for the better of the project.

Shigeo Shingo, one of the early creators of the Toyota Production System, said, "There are four purposes of improvement: easier, better, faster and cheaper. These four goals appear in the order of priority." In other words, we should focus on making it easier for people to do a better job. When we do that well, becoming faster and cheaper will naturally follow.

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http://www.paracomm.com/empowerment-article/

The Five Dysfunctions of a Team, Patrick Lencioni
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Additional Readings

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5.2 Mechanical Systems

5.6 VDC for Lean Project Delivery A3s

BIM and Value Stream Mapping Robert Mauck

Commercial Terms to Support Lean Project Delivery

Competition and Collaboration are not mutually exclusive

Conflicts Between Contract Law and Relational Contracting

Contracting for Lean in Design Build

Lean in Design

Lean Journey-Lean Transformation of a Company

Psychological foundations for incentives

Toyota Culture

CHAPTER 15

HIERARCHICAL VS. DISTRIBUTED LEADERSHIP

Introduction

For those embarking on their Lean construction journey, it is important to understand that team culture and team cohesion on Lean/IPD projects are very different from what is commonly found on traditional projects. Therefore, choosing the right type of leadership structure for the collaborative environment is key. According to William Seed in his paper titled *Integrated Project Delivery Requires a New Project Manager*, "The transformational change required for [Lean/IPD] calls for project leaders who possess group facilitation skills, management skills, organizational skills, people assessment and change management skills, along with the tactical skills of the past.[1]" This type of leader requires a new type of organizational leadership structure.

When the group lacks experience or skills and needs guidance from superiors, a hierarchical organization structure works best. When the group has the expertise to get the job done, a non-hierarchical structure with decentralized authority works best.

1.0 Why

Leadership is an essential requirement for initiating change, developing cohesive teams and creating high-performing teams that deliver results. As more companies and projects are trying different approaches to increase productivity, engage workers, foster innovation and improve team dynamics, new leadership approaches are emerging. Team building and power sharing are resulting in traditional Hierarchical Leadership structures being replaced by more collaborative and inclusive leadership structures, commonly referred to as Distributed Leadership structures. Within this Distributed Leadership structure, a new style of leadership is developing. In addition to the skills highlighted by Seed, these new leaders are also required to share in leadership responsibilities and act as collaborative leaders. Since Lean/IPD is built around teams, these teams—comprised of members from various different companies—must be organized, managed and motivated properly to create High Performing Teams.

2.0 How

Integrated projects establish a network of small teams of multi-disciplinary experts to work together to optimize problem solutions. These focused teams report needs and progress to the project team and work with other focus teams to share and understand impacts of their decisions during a structured and repeating Big Room meeting process. When the work progresses to the field, the Last Planners become empowered to work together to solve problems as they arise. Open transparent information flow is critical to the success of this empowerment.

This type of Distributed Leadership structure enables groups to focus on specific tasks and allows specialists performing the work to have a high degree of autonomy and sense of empowerment. Leadership is often shared among those involved based upon expertise in the current focus area and situation. Decisions are usually made on a consensus basis versus a single decision maker in a "command and control" hierarchical position.

3.0 What

Traditional construction projects are managed in a hierarchical structure. The term "hierarchical" is defined as "the classification of a group of people according to ability or to economic, social or professional standing," or "a graded or ranked series."[2] Group success requires matching the leadership approach to the maturity and capability of the group members and the type of tasks being delivered.

In Distributed Leadership, groups let go of traditional command-and-control behaviors.

When the group lacks experience or skills and needs guidance from superiors, a hierarchical organization structure works best. When the group has the expertise to get the job done, a non-hierarchical structure with decentralized authority works best. Given that ILPD teams depend upon the strong expertise of each member involved, are often "self-selected" through the Choosing by Advantages process, and are chosen based on best value, the best way to leverage the breadth of skills of the ILPD team is through a Distributed Leadership approach.

According to the Collaborative Lead Training Company in a 2012 article titled "8 Differences between Traditional and Collaborative Leaders,"[3] the following eight characteristics exemplify collaborative leaders:

- Believe power is greatest in a collective team
- Openly share information and knowledge
- Encourage suggestions and ideas from their team
- Facilitate brainstorming with their team

- Enable their team with immediate time and resources
- Allow roles and responsibilities to evolve and fluctuate
- Seek to uncover root causes of issues
- Offer immediate and ongoing feedback with personalized coaching

By employing the appropriate leadership approach, project leaders can enable the project team to develop more innovative ways to achieve widespread optimization and better project results overall. Distributed Leadership fosters 1) better innovation on projects because ideas can come from multiple inputs rather than just the labeled experts in the room and 2) better knowledge distribution so the project team can still remain high performing even if people come and go.

Recommendations for maximizing the success of Distributed Leadership includes:

- A willingness to let go of traditional command-and-control behaviors
- An inclination and ability to solicit information from others with different perspectives
- Humbleness and a spirit of continuous learning
- Decisions need to have buy-in for them to be effective

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HIERARCHICAL VS. DISTRIBUTED LEADERSHIP

Quick Reference

For additional readings and information, please see the below information.

CHAPTER 15 – HIERARCHICAL VS. DISTRIBUTED LEADERSHIP

Additional Readings

Barrett-Self-Organization and Synchronization at the Edge

Implementing Edge

Psychological foundations for incentives

CHAPTER 16

RETROSPECTIVES

1.0 What

It is common for team members to experience the same problems or encounter variations of multiple projects throughout their careers. Oftentimes these projects have different team members who have individual goals and tend to think only about the issues at hand. This in turn can lead to a significant amount of waste. In the construction industry, waste can exceed 50% of a project's cost. Lean/IPD projects strive for continuous improvement and attempt to address the issues of waste by regularly using Retrospectives.

A Retrospective is a structured reflective event resulting in a common understanding of a team's experience. The Retrospective leads a team to new action. It is the "Check" part of a Plan Do Check Adjust (PDCA) process.

A Retrospective is a structured reflective event resulting in a common understanding of a team's experience. The Retrospective leads a team to new action. It is the "Check" part of a Plan Do Check Adjust (PDCA) process.

2.0 Why

Retrospectives create value on Lean/IPD teams that are willing to take the time and effort required to stop momentarily, review specific actions or events, realistically assess the plan/actions/outcomes against the expected outcome, and commit to improve the next event. Teams should conduct Retrospectives in a structured, open forum for the purpose of improving future effectiveness. Retrospectives facilitate continuous learning and improvement; they should be used to ensure improvement of any repeated work cycle. A Retrospective is intended to create a positive outcome and should focus on processes, not people.

3.0 When

Retrospectives can be done at any time in a project and in a variety of formats:

- Quick-format Retrospectives can be conducted at the end of every meeting or work session.
- Regularly occurring Retrospectives can be conducted at the completion of work cycles or on a recurring basis such as every three weeks.
- Event-based Retrospectives can be conducted at the completion of major milestones or the declaration of a major Breakdown.

4.0 How

- Quick-format Retrospectives:
    - Use the Plus/Delta format.
    - Are typically facilitated by a team member.
- Regularly occurring Retrospectives:
    - Reflect on some portion of the work/process. In doing this, the team asks three questions:
    - What do we want to keep doing?
    - What do we want to stop doing?
    - What do we want to start doing?

- Can be done in an open-team format, an anonymous format, or a small breakout group format
- Are typically facilitated by a team member.
- Require the team to align with new actions to take. The new actions will involve team member commitments to drive the new actions.

Note: For more information about conducting regularly occurring Retrospectives, see [Lean Project Consulting - "Retrospectives, Making it Simple"].

- Event-based Retrospectives:
  - Require that an Agenda be issued in advance of the Retrospective see Lean Project Consulting "Retrospective Agenda." The agenda must include Goals, Ground Rules, and Process.
  - Require that participants come prepared to engage in a constructive manner.
  - Require the team to align with new actions to take. The new actions will involve team member commitments to drive the new actions.
  - May be facilitated by a neutral party, depending on the situation.

Resources

"Retrospective Agenda" by Lean Project Consulting / Rebecca Bettler, 2008

"Retrospectives" by Lean Project Consulting / Rebecca Bettler, 2011

"Retrospectives, Making it Simple" by Lean Project Consulting, 2012

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RETROSPECTIVES

Quick Reference

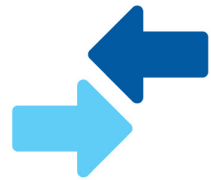
For additional readings and information, please see the below information.

CHAPTER 16 – RETROSPECTIVES

Additional Readings

Conflicts Between Contract Law and Relational Contracting

CHAPTER 17



RISK & OPPORTUNITY REGISTER

Introduction

One of the greatest challenges owners and/or builders face when delivering capital projects is cost management, particularly when projects involve many partners and include complex elements that introduce more uncertainty and risk. By using a Risk and Opportunity Register in project management, project teams can identify, share and disclose risks in a transparent manner to collaboratively manage, mitigate and preferably eliminate risk. A Risk and Opportunity Register also helps teams identify opportunities to enhance a project in ways that typically go unnoticed.

A Risk and Opportunity Register is part of the overall strategy of building a visual workspace. It allows risks and opportunities to be identified and assessed early, and allows the team to apply intellectual capital rather than financial capital to mitigate or avoid risks.

1.0 Why

Traditionally, project leaders manage risk through a contingency fund that is designed expressly to cover costs associated with unforeseen circumstances. Typically, risks incurred early in a project reduce the fund quickly, and later risks are represented as justifications for additional funding. Risks are not made visible early enough to allow the full team to respond.

A Risk and Opportunity Register is part of the overall strategy of building a visual workspace. It allows risks and opportunities to be identified and assessed early, and allows the team to apply intellectual capital rather than financial capital to mitigate or avoid risks. When used effectively, a register can help the project team avoid unnecessary costs that can translate into additional value for all parties involved–trade partners, design partners and owner.

The opportunity side of the register offers many benefits. It can offset risks, create a pool of money to serve as an incentive pool for the team to enhance profits, or act as a funding source to drive additional value to the project. Often, teams are so focused on risks that they fail to give consideration to opportunities. Having an actively managed Risk and Opportunity Register encourages project teams to look for and consider opportunities that can enhance the value of the project.

Finally, the register provides an effective tool for sharing knowledge. Everyone on the team contributes, adds information and views information contributed by others. The register also is the basis for weekly or monthly meetings on risk management. At the end of the project, the register provides teams with a record of how risk was managed, and the gains realized through the process for the client and the individual partners.

Teams are often unaccustomed to thinking rigorously about opportunity and risk. It requires practice for it to become a routine part of thinking during planning sessions and work in the field.

The register is a valuable tool for a project of any scope or type and during all phases of development, from project conceptualization to commissioning. However, the Risk and Opportunity Register is mandatory for any Lean/IPD project because the partners are collectively at risk for failure and collectively benefit from any opportunity.

2.0 How

Integrate the Register Early. Share the document and incorporate it into your meetings as early as possible. Too often risks aren't identified until they have already become problems. For this reason, it is important to identify each risk early even if there is a relatively low probability of the risk surfacing. For example, if there is a 5% risk that a supplier will be six months late, the relevant leader should flag the risk so the appropriate team members can begin thinking about potential solutions or alternatives.

Exercise Discipline. Discipline is required to effectively manage the register. This includes updating the list before the meeting, and agreeing on what items should be acted upon and by what time. Ensure adequate time is devoted to register management. In the early stages of the project, longer meetings with the team may be needed to discuss the register. As the list of items on the register grows, it might become necessary to filter items by date according to those that are most time sensitive.

Encourage Problem Solving. One of the most valuable benefits of the register is the ability to encourage problem solving. For example, often a contractor will ask a subcontractor if he or she can adhere to a new, more aggressive deadline. The default response may often be an unqualified *yes* or *no*, with little to no discussion. This is problematic as the *no* means there is little flexibility while the *yes* may represent an unreliable commitment. Instead, encourage structured dialog on these topics. The following phrases can encourage such discussions:

"Yes, I can make that problem go away *if*..." or "Yes, I can make that opportunity happen *if*..."

These conversations can help teams strategize how to make the "ifs" happen. These "ifs" can lead to significant savings in production costs.

Brainstorm for Opportunities. Teams are often unaccustomed to thinking rigorously about opportunity and risk. It requires practice for it to become a routine part of thinking during planning sessions and work in the field. Involve everyone on the team in these discussions and encourage all to contribute.

3.0 What

A Risk and Opportunity Register is a list of risks and opportunities with a probability and cost estimate for each, aggregated into a collective risk dollar amount for the project.

Typical broad topics that can generate line items within the register include:

- Changes in assumptions and/or occurrences about escalation (important on large multi-year projects)
- Changes in assumptions and/or occurrences about when and what items will be procured
- Changes in the basis of estimate
- Changes in the basis of budget
- Uncovered discrepancies between the basis of budget and the basis of estimate
- Uncovered discrepancies between the basis of design and the conditions of satisfaction
- Labor productivity
- Uncovered issues in the representation (design, shop drawings, fabrication details, equipment cut sheets etc.)
- Uncovered issues in the realization (fabrication, procurement, installation, commissioning) Uncovered issues with regulations (i.e. misunderstandings of what it takes to comply)

Various formats for representing the Risk and Opportunity Register are provided in the two figures below:

Figure 1: General format example of a summed list for a Risk and Opportunity Register

Description	Condition of Satisfaction	Probability (%)*	Cost ($)**	%x$	Champion	Sunset Date
Price of primary widget has quadrupled due to closing of 95% of widget mines	Cost Constraint of "less of $500MM"	80%	$100MM	$80MM	Dr. Worm	July 4th, 2076

Description: Brief explanation of the area of risk or opportunity. An example might be "potential for delay in receiving supplier materials."

Condition of Satisfaction: The overarching goals of the team

Probability: The likelihood that the event will actually happen. It's inherently a subjective assessment and doesn't normally need a deep diving analytical process. A gut feeling is usually sufficient.

Cost: Two similar definitions that amount to close to the same thing "reasonable worst case cost" and "a cost that could go up by up to 5% or drop to up to 20% less." The product of the percentage and the cost is %x$ (percentage multiplied by cost). This figure can be placed in a line graph to track performance of risk and opportunity management over the life of the project.

Champion: The team member who has ownership of the issue. They will likely need help from others on the team to either eliminate or validate the risk, but it is their responsibility to see it through to the end.

Sunset Date: The date given for the next notable action item, milestone, or discussion of the issue. It is good practice to allow the pull plan to inform this date for final resolution (or last responsible moment).

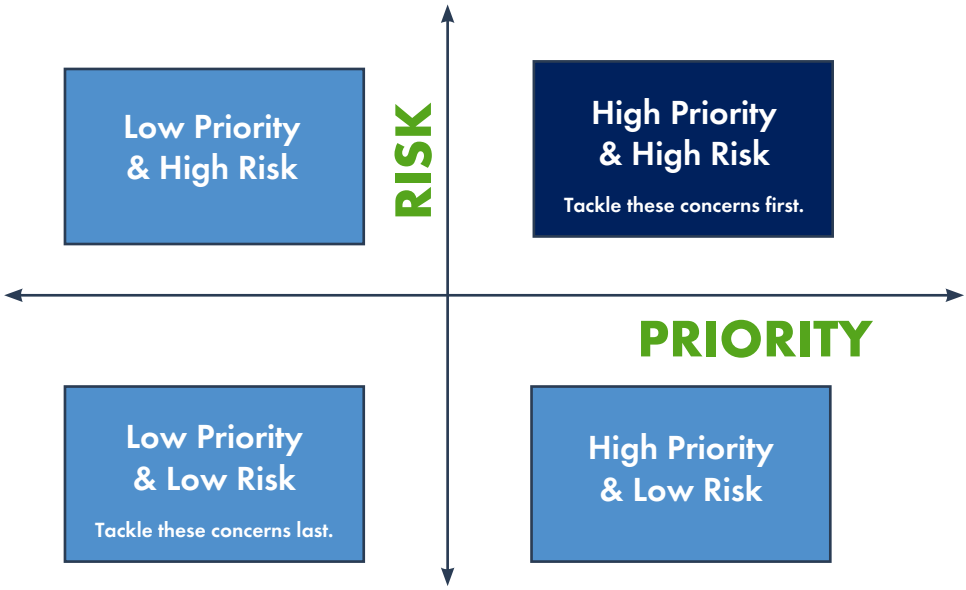


Figure 2. Risk-Priority Matrix

3.0 When

A Risk and Opportunity Register should be utilized from the inception of the project concept through the activation of the asset.

Early phases: At the very start of a project consider getting the integrated team together with the key representative(s) from the owner and/or user and ask the following questions:

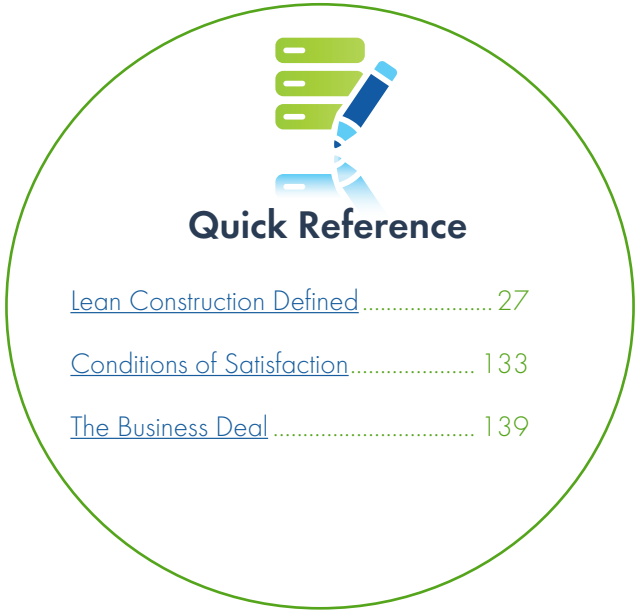
- We all know this project will be an unmitigated success, but in the hypothetical scenario where it is not, what are the things that could happen that would cause us to fail?
- You have the power to make things happen on this project that will improve it. Perhaps these are things you have seen work well on other projects or things you have always wanted to happen. What are those things?

With those questions answered, the team can formulate a strategy to eliminate, mitigate, or manage each risk, and develop a strategy to allow each opportunity to occur.

Later phases: Later in the project, the meeting becomes a regular one where you, as noted above, assign estimated probabilities and costs. Management of the Risk and Opportunity Register is recommended to occur somewhere between weekly and monthly. On smaller projects, it can be an agenda item during a larger meeting. On larger projects, it will often be its own meeting.

4.0 Who

The Register is used by leaders with the owner, designer, architect, general contractor, trade partners, and more importantly, others directly involved in the actual risks and opportunity as needed.



For additional readings and information, please see the below information.

CHAPTER 17 – RISK AND OPPORTUNITY REGISTER

Additional Readings

Commercial Terms to Support Lean Project Delivery

Conflicts Between Contract Law and Relational Contracting

Contract or Co-Operation Insights from Beyond Construction Collaboration - The Honda Experience

Contracting for Lean in Design Build

Discrete Event Simulation Enhanced Value Stream Mapping an Industrialized Construction Case Study

Fuller Theory of Driving Behavior

PPC2000 Association of Consultant Architects Standard Form of Project Partnering Contract

Project Alliancing a Relational Contracting Mechanism for Dynamic Projects

Reliable Schedule Forecasting in Federal Design-Build Facility Procurement

Social Construction Understanding Construction in a Human Context

Why Isn't the UK Construction Industry Going Lean with Gusto

CHAPTER 18

EXPERIENCED LEAN PARTNERS (BIG L)

1.0 Why

Lean/IPD is a transformational journey for all participants in any project delivery. As with any change, the faster the participants can develop effective behaviors, the faster they become a High-Performing Team. Because most programs and projects require the participation of many vendor firms and individuals on a relatively temporary basis, it is crucial for teams to find and work with as many experienced partners as possible. Teams typically do this through Partner Selection.

For repetitive builder organizations, an Experienced Lean Partner (Big L) becomes a long-term business partner and can act as an extension of the owner/operator staff.

Experienced project teams often find that a minimum of three partners that can work in a leadership role—preferably more—are required to keep a team successfully on-task. Team Forming and Onboarding efforts are critical to this success. For repetitive builder organizations, an Experienced Lean Partner (Big L) becomes a long-term business partner and can act as an extension of the owner/operator staff.

2.0 What

A Big L is a project leader who advocates for the Lean project delivery process and is actively involved in training and mentoring others involved in the project. A Big L is typically a primary contract signer and involved in the Business Deal. A Big L helps to create and champion the Conditions of Satisfaction—and thus align all participants with the team-determined goals of the project. A Big L Facilitates meetings with strong Agenda and Big Room management. It is helpful to enlist a variety of Big Ls from various industry perspectives—for example, architects, designers, trade partners and GCs. It is often easier for peers to encourage or mentor each other rather than learn from traditional customer/vendor relationships. Several Big Ls must share project leadership and champion the change process in moving from traditional to integrated project delivery, particularly because reversion to old thinking is a constant threat. If these Big L partners are in non-traditional leadership roles, it helps set the stage for a significant project cultural change.

Big Ls:

- Are among the first partner selected to form a new project team.
- Must be knowledgeable of and an advocate for Lean thinking and the Lean/IPD processes.
- Have strong leadership abilities.
- Behave as an extension of the owner's staff.
- Have or create a long-term business relationship with the owner and others.
- Must be a committed Lean/IPD learner—not just for the project but also for his or her own firm/company.
- Bring expertise to the project.
- Are a Lean/IPD advocates in the marketplace.
- Help others with Lean growth without business provocation.

- Must be capable of assuming non-traditional leadership roles.
- Must be willing to admit mistakes and self-correct when deviating from Lean practices.

A Big L is a long-term partner with his owner clients because of the value generated as a team. A Big L can differentiate himself from his competitors by being a market leader, becoming more efficient and being known as an industry change agent.

Becoming a Big L is both challenging and valuable. A Big L is a long-term partner with his owner clients because of the value generated as a team. A Big L can differentiate himself from his competitors by being a market leader, becoming more efficient and being known as an industry change agent.

A strong partnership with a client and a Big L partner will share the following characteristics:

We believe mutually beneficial partnerships will drive Better Project Delivery: product outcome, delivery experience, Conditions of Satisfaction, and parallel learning.

Partnerships will require a commitment to Consistent Learning: develop baselines, improve performance, measure outcomes, and improvement on each project.

We as partners will be dedicated to Continuous Improvement: pursuit of perfection, challenge old ways, challenge each other, and grow in knowledge together.

A common understanding of our partner's needs will help Drive Customer Value: assessing the customer's real needs, determining value, treating each other as customers, caring about each other's needs.

Understand Owner/Operator Processes and Experiences: on boarding, O/O standards and specifications, payment process, informational needs, improving for collective benefit.

Retain Partners for Future Projects: creating relationships, understanding expectations, maintaining a deep level of trust, continued work, training new partners together.

Selecting the Right Partners for the Right Projects: understanding skills, right-sizing partner to job, balancing workflows, preparing the team for success.

Partners will look for ways to Improve the entire Value Stream: understanding the value stream, looking for waste, improving the process, purchasing, handling payments and group buy, keeping promises, examining each other's processes to drive improvement.

Meeting Prequalification Standards: insurance, work ethic, experience.

Define and Assign Scope that Adds Maximum Value: determining who does what work, how much work, and when, identifying risk, quantifying it and covering it with skill or mitigation funds and efforts.

Quick Reference

Leadership and Lean IPD Projects 69

Team Partner Selection 117

Continuous Improvement 179

CHAPTER 19

EARLY STAKEHOLDER INVOLVEMENT

Introduction

Traditional project delivery delineates clearly between the design phase and the construction phase. These projects assume the build process is a commodity and the best way to drive value is to tender a bid and select the lowest cost qualified participant. Collaborative projects have shown that there is significant benefit when the trades and specialty contractors are invited to assist during the design phase. Input from the builders informs better constructability, identifies more material and product selection, and provides a more complete design. Additionally, it affords the project many alternatives in regards to pre-fabrication and component assembly, and significantly increases predictability through improved efficiency, safety and quality.

There are numerous benefits to bringing in partners early. The most significant among them are a cost savings and the elimination of waste.

1.0 Why

There are numerous benefits to bringing in partners early. The most significant among them are a cost savings and the elimination of waste. Early stakeholder involvement reduces the risk of having to reconfigure designs or work that could have been prevented. Additionally, the MacLeamy curve in Figure 1 below shows how it becomes more difficult to change a project the more developed it becomes.

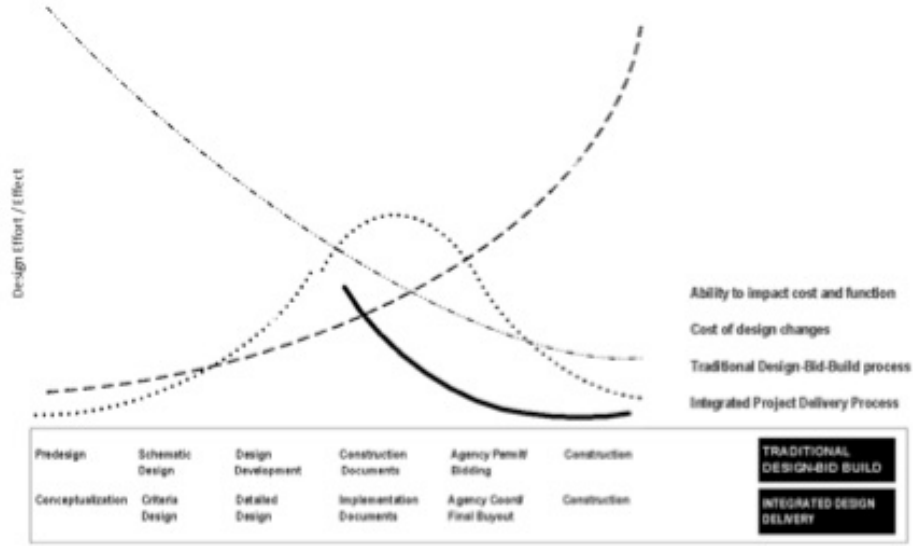


Figure 1. MacLeamy curve. Adapted from MSA (2004) as introduced by MacLeamy (2004).

Other benefits of early stakeholder involvement include:

- Cost and delivery predictability
- Faster and more reliable cost estimating
- Reduced schedule through concurrent shop drawing/submittal processes
- Reduced schedule/better coordination through earlier material procurement
- Stronger team cohesion
- Opportunity to design for modular or prefabricated solutions

- More frequent and constructive conversations with owners and/or facility operators
- More innovative solutions from those closest to the work
- Better information to inform the drawings
- Greater accountability and engagement across the supply chain

Research shows that when partners are brought in earlier in a project, the level of shared knowledge among partners is acquired faster than in traditional design-bid-build projects. This reduces the traditional use of Request for Information, field changes, coordination errors and schedule delays.

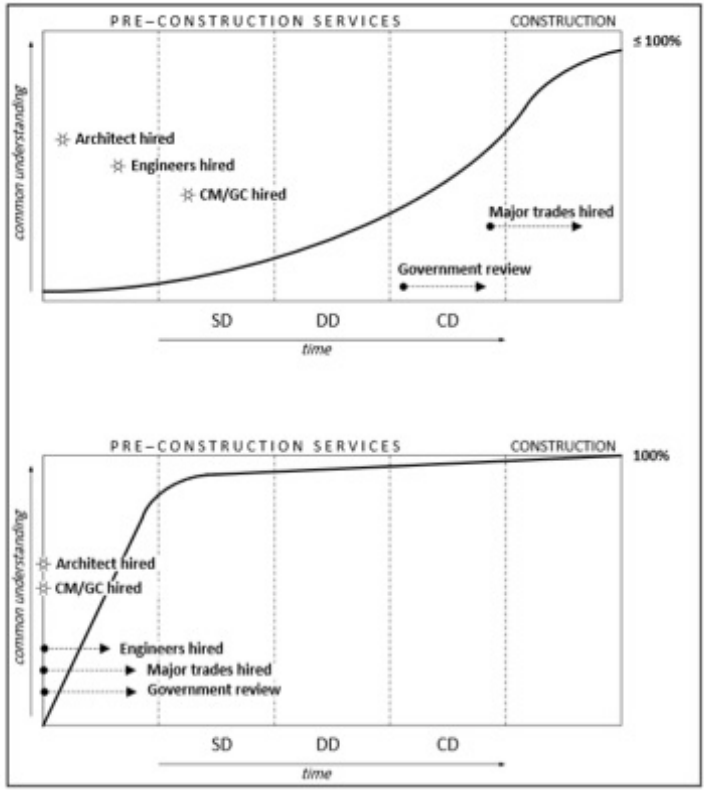


Figure 2. Shared project knowledge by team members during typical Design-Bid-Build project delivery (top), and during Lean Project delivery (bottom). Adapted from Lichtig (2008), as presented by Feng and Tommelein (2009).

The approach to integrating partners earlier is fairly straightforward. Begin by developing a Request for Proposal that defines earlier stakeholder participation, then choose partners through a collaborative interview process structured more like a work session than a formal interview.

2.0 How

As part of the early stakeholder involvement process, determining who can add value during which portion of the project is a value-based decision. Rather than choosing by low price bid, you should look to other attributes such as a willingness to learn, chemistry among team members, innovativeness, skills, experience and expertise.

The approach to integrating partners earlier is fairly straightforward. Begin by developing a Request for Proposal that defines earlier stakeholder participation, then choose partners through a collaborative interview process structured more like a work session than a formal interview. Spend time defining the desired attributes of those partners so that those performing the selection understand the parameters (since the parameters are not transaction based, as in a traditional process).

This engagement should be structured so that partners are compensated for contributing during the design assist and pre-construction phases, and have the opportunity to continue into the build portion and/or compete to become full project partners. A request for commercial terms should contemplate current and future contracting alternatives so that they are understood up front. When developing the commercial terms—best value, unit pricing, lump sum, time and materials, or other—be sure to factor early partner involvement into project spend projections. While early stakeholder engagement has additional upfront costs, it results in lower overall costs for the whole project, since the risk for error will be significantly reduced.

Be aware of potential obstacles to involving stakeholders earlier in the process. It may be difficult to recruit partners to collaborate on a design before there is a defined scope of work. Traditionally, stakeholders respond to developed ideas better than they do to concepts and sketches. Many collaborative projects have found it beneficial to include a Lean Coach to serve as an advisor during the design, pre-construction, and build phases.

3.0 What

A key to successful project delivery is engaging all stakeholders at the best possible moment. This ensures that the expertise of the end users, skilled trades and other contributors is utilized in a manner that optimizes performance. This is a departure from how the building industry has traditionally operated. For example, trade partners are not typically involved as the design is being vetted or finalized; they are typically engaged during the pre-construction or construction phase.

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"Collaboration, Integrated Information, and the Project Lifecycle in Building Design and Construction and Operation"; MacLeamy, P. (2004). Introduced at the Construction User's Roundtable, WP-1202, August

For additional readings and information, please see the below information.

CHAPTER 19 – EARLY STAKEHOLDER AND INVOLVEMENT

Additional Readings

Lean and IPD Panel

2 Update on Target Value Design 2 TVD Update ppt

5.1 Integrated Structureal Steel Design for Lean

5.4 Case Studies of VDC for Lean Project Delivery

9-15-08 Lean Construction Opportunites Ideas Practices

A3 Decision Analysis Using Virtual First-Run Study of a Viscous Damping Wall System

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Owner Perspectives-UHS

PPC2000 Association of Consultant Architects Standard Form Of Project Partnering Contract

Prefabrication and Pull Planning at Scale-Parkland Hospital

Presentation 02-The Big Room-final

Project Alliancing A Relational Contracting Mechanism For Dynamic Projects

Project Definition

Projects in Review-Integration of Lean Tools and Takt Planning-4

Projects in Review-Revolutionizing Construction Management with Lean and Last Planner

Projects in Review-The Facebook Journey

Reflections on Co-Location

Reverse Phase Scheduling Slides - George Zettel

Schedule for Sale Workface Planning for Construction Projects

Target Value Design AIA Practice Digest

Target Value Design Current Benchmark

The Lean Project Delivery System An Update

Three opportunities created by Lean Construction (new)

Transitioning to Integrated Project Delivery Potential barriers and lessons learned

Using a design-build contract for Lean Integrated Project Delivery

Value Delivery through Product Offers A Lean Leap in Multi-Storey Timber Housing Construction

What makes the delivery of a project integrated A case study of Children's Hospital, Bellevue, WA

CHAPTER 20

RAPID CREATION OF A HIGH-PERFORMING TEAM

1.0 Why

The project team is the lifeblood and foundation of an effective and efficient Lean/IPD project. The challenge of many projects is that this team is also temporary and needs to be able to perform at a high level relatively quickly. For this reason it is important to quickly create a high-performing team so that it can to make the significant changes required in order to deliver the outstanding results expected. Most traditional teams do not successfully tap into the full collective knowledge of the participants. Additionally, because the Lean/IPD project creates a new culture that requires different behaviors effective Partner Selection and rapid team building provide the opportunity to shift the behaviors that help drive the culture evolution.

Rapid High-Performing Teams enable you to see results more quickly.

2.0 What

A high-performing team:

- Is built on a strong foundation of trust among all team members.
- Has a strong team culture of respect that enables members to effectively deliver against Conditions of Satisfaction.
- Celebrates both small and large successes of the team and the individuals.
- Breaks down barriers through innovation and continuous Retrospection.
- Breaks down traditional silos to maximize skills and optimize performance.

The result of long-term relationships is better and better quality and lower and lower costs.

3.0 How

Team building events:

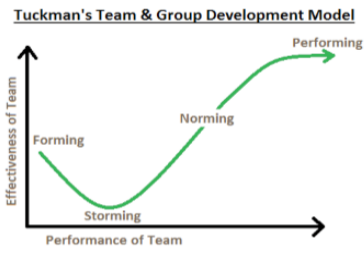
- Team review of the Leadership chapter.
- Identify and align on the team goals. The internal team challenges should be aggressive to the point that achieving them requires near perfection. These are different than the external team goals which define the project as successful. The goals must be aligned with project Conditions of Satisfaction.
- Develop the vision for the team through Onboarding.
- Identify and deliver training the team needs to become high performing on the project/task at hand (using simulations where beneficial).
- Identify team norms.
- Develop project specific diagrams, noting team member roles and interfaces.
- Create a framework and environment for effective peer-to-peer coaching and mentoring to develop required behaviors.
- Assess individual and team strengths to identify and breakdown barriers that could inhibit successful execution. Ensure the strength assessments are transparent to other team members and are conducted within a team development training exercise.

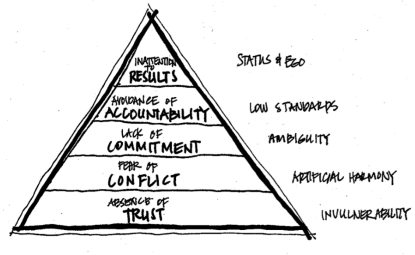
Create a framework and environment for effective peer-to-peer coaching and mentoring to develop required behaviors.

- Focus on listening to others and be aware of how personal perspectives contribute to what participants hear.
- Create an environment that allows all participants to actively speak their minds.
- Define roles and responsibilities and facilitate their evolution through continuous learning.

Goals and outcomes of the events:

- Move quickly through the forming, storming and norming phases of team development so the team is performing at a high level on the project.
- Develop a plan to maintain and continuously strengthen the team "health" throughout the "project."
- This should include team assessments.
- Define and build the project or team culture specifically needed for the success for this specific project/team.
- Develop team culture.





Things to keep in mind:

- Be aware of the external cultures that will also affect the culture and performance of the team.
- Team creation is a continuous process.
- Be mindful of team boundaries and where they lie within a specific team and the larger project team.

Breakdown warning signs:

- Information being withheld.
- Decisions made in a vacuum .
- Deliverables consistently missed.
- Conflict not visible and not constructive.

References

Speed of Trust, Stephen M.R. Covey

The Five Dysfunctions of a Team—Patrick Lencioni

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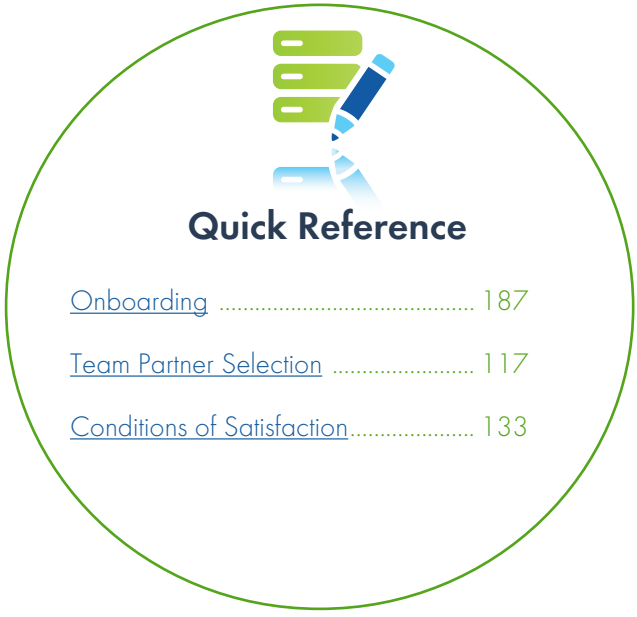


For additional readings and information, please see the below information.

CHAPTER 20 – EARLY STAKEHOLDER AND INVOLVEMENT

Additional Readings

2 Update on Target Value Design 2 TVD Update ppt

5.5 Digital Design-Emdanat

6 Final Changing Rolesppt

9-15-08 Lean Construction Opportunites Ideas Practices

A3 Decision Analysis Using Virtual First-Run Study of a Viscous Damping Wall System

Competition and Collaboration are not mutually exclusive

Implementing Integrated Project Delivery on Department of the Navy construction projects

Integrated agreement on one page

Presentation 02-The Big Room-final

Project Alliancing A Relational Contracting Mechanism For Dynamic Projects

Southern California Owners Forum

Standards and Measures - Whole-building Metrics Driving Innovation and High Performance

Transitioning to Integrated Project Delivery Potential barriers and lessons learned

CHAPTER 21

TEAM PARTNER SELECTION

1.0 Why

Lean/IPD project teams produce better results when they work with a broad spectrum of specialists and builders early in the design process. This broadens the team knowledge, amplifies the ability to identify risk and mitigation strategies, and delivers better constructability outcomes. When a project team works with a variety of specialists, the team also will have an early understanding of costs–thus empowering the owner/operator with improved Value decision-making capability.

The success of any project is linked to the ability and synergy of a team and how quickly it can reach high performance. Who do you select? When do you make the selection? How do you make the selection?

The success of any project is linked to the ability and synergy of a team and how quickly it can reach high performance. Who do you select? When do you make the selection? How do you make the selection?

The typical process of selecting team members is broken and laden with wasted effort. Hundreds of pages in an RFP response are never read; the Vice President of Business Development never delivers on his promises; or only the least expensive initial prices are selected.

When assembling Lean/IPD project teams, it is crucial to use a different approach and select team members who will deliver the right project for the best cost, as determined by assessing the delivered cost against the bid or first cost.

Effective Lean/IPD teams:

- Use conceptual estimating (specifically Target Value Design);
- Collaborate well;
- Have effective team chemistry;
- Innovate; and,
- Are comfortable in a learning environment.

The RFP and assessment process should therefore seek to determine these effective team traits.

Assumptions:

- Application can be open to any team member, from designer to GC/CM to trade partners to consultants, etc.
- Application is intended for one team for a specific project, but with the intent of forming a long-term healthy relationship.

Trust is developed when transparency goes both ways.

2.0 Who

What makes a high-performing team member? The following assumes the potential partners have met some level of pre-qualification to ensure technical capability and financial soundness.

Factors and criteria:

Ability to affect the final project Conditions of Satisfaction: The intent of the factors listed below should be considered in the light of how this team member can affect the final overall project outcome, not just the member's "legacy responsibilities.

Name on the truck or the person: (Company alignment is good; personal alignment is better).

- The company culture and values should align with the team and their goals.
- The proposed team members should have the support of the company leadership.
- The importance should lie on the connection of the team to the proposed individuals from those companies.
- The selection should ensure that the proposed team members are aligned with team values and culture that support the team goals.

Note: This can be managed as a two-phased approach of qualifying the company and then interviewing individuals for the right fit.

Chemistry: (More comfort with personality fit is better; do they fill a strength gap?)

- Do the proposed team members have a natural chemistry with the current team?
- The selection process should illuminate individuals' natural strengths and weaknesses.
- This is similar to the interview process of hiring an employee for your company. Do the proposed team members fit in, and how will they function in this team environment?

Innovation: (More innovative nature is good, more evidence of innovation is even better.)

- Do the proposed team members challenge themselves, their company, and/or the industry to try new things?
- Where have they innovated within their own organization?
- Where have they innovated on recent projects?

Learning and Continuous Improvement: (More learning attitude is good; more examples of continuous improvement is better.)

- Are the proposed team members humble enough to admit there is always room to learn and improve, yet confident in their skill sets and knowledge?
- Can the proposed team members provide examples of their humility and confidence?

Commercial Terms: (Clear and concise documentation of terms is good; comfort with an Integrated Form of Agreement (IFOA) is better.)

- While this should not be a major focus for selection, it is prudent to understand a company's terms for doing business and their endorsement of the team's contractual arrangement.
- Have these items on hand during the selection process:
  - Profit – especially if the delivery method will involve IFOA, the company needs to state what profit they would be willing to place at risk. This is typically and initially based as a percentage of the company's work responsibility.
  - Overhead – what amount keeps the lights on in the home office? This is also typically based on a percentage of the company's work.
  - Personnel Rates – what is the billable rate for salaried personnel and the rates for direct labor + burdens?
  - Define the difference between Direct Cost and Indirect Cost.

  Note: More information can be requested, but understand that you should attempt to establish a level of trust and transparency—even at this earliest stage. If a potential team member perceives that you are "case building," then the team is already pointed in the wrong direction. Trust is developed when transparency goes both ways.

  When using an IFOA the terms are full open-book accounting. It is imperative that all team members are open and willing to share the details of their costs and how they get assigned to a project. While it is understood that firms have different accounting methods, this sharing is necessary to insure no costs are doubled up.

Desired Skillset: (Stronger and more effective skills are better.)

- Conceptual estimating – can the proposed team members effectively forecast the direction of the project cost and clearly relay that information to the team? Can they envision the project that answers the Conditions of Satisfaction and illustrate those costs?
- Speak up and Speak out – can the team members function in a group and challenge each other in a respectful and non-disruptive manner?
- Forecasting – can the team members understand the anticipated effort to accomplish the team goals and forecast the time and costs that support that accurately?
- Transparent – are the proposed team members comfortable sharing all of their detail that supports their estimating and forecasts?
- Self-Awareness – can they recognize when additional resources are necessary and ask for help?
- Technical Skills – are the proposed team members highly capable in core work product responsibilities?

When using an IFOA the terms are full open-book accounting. It is imperative that all team members are open and willing to share the details of their costs and how they get assigned to a project.

3.0 How

What is the process to get the right team members at the right time for a project?

Self-Selection:

- The team grows organically. For example, the Client selects Team Member A, the Client and Team Member A select Team Member B, the Client and Team Members A and B select Team Member C, and so on.
- This type of team assimilation helps ensure trust and value-based selections, and aids in faster team synergy.

Risk Based Selection: (not mutually exclusive with Self Selection):

- What are the greatest risks and/or decisions facing this specific project? Which experts can best mitigate that risk or inform those decisions?
- Mapping out the decisions and their placement on the project timeline should inform when the team members are selected and onboarded.
- This keeps the early project development spend in check and forces the team to understand the risks and decisions that need to be addressed.

The Invitation:

- The request for proposal (RFP) should set the stage for the type of environment you are attempting to create. It should also focus on the key aspects. Is the ask lengthy, wordy, and loaded with legalese that attempts to paint a member into a financial corner, or is it efficient and direct? Does it explain the nature of the project, explain why the team member is being asked to the table, and highlight what the team is specifically looking for in a new team member?
- It is helpful to include the meeting agenda.
- Some teams have been successful in using the A3 format for both the RFP and the expected response. They also request résumés for all proposed team members.
- Allow responders enough time to develop a response. For an A3 response, two-to-three weeks has proven enough to frame and develop the response. The RFP should be built to suit each project.

Note: As soon as a need is known, reach out to potential team members and give them time to ensure appropriate team members can be made available for upcoming projects.

The Meeting:

- The actual meeting is best framed as a conversation interview, and not a prepared presentation. Think about how you would interact with a potential employee.
- Facilitation – the meeting led by the right person helps ensure successful outcomes.

Interviewers should:

- Understand and reach consensus on the selection criteria.
- Ask the team what has made a good team member in the past, and what questions can illuminate that trait in the proposed partner.
- Assign those questions to individuals to ensure that those traits surface during the interview.
- Address questions to specific proposed team members, and hold them accountable to respond to the interviewer. Try to avoid the proposed team members from passing the question to their desired responder.

The Room:

- If possible, use a round table; it will best facilitate direct conversations.
- Strategically and sporadically place empty seats around the table to force the proposed team members to spread out among the current team. This seating arrangement avoids the Us vs. Them scenario and facilitates better conversations.

- Allow enough time for conversation. Have a dedicated person manage the clock. Interviews lasting from 45 to 90 minutes have proven to be appropriate.
- Allow enough time between interviews to discuss and document the findings.

Note: Teams have experimented with different types of interview styles–including problem resolution in a team atmosphere and work site visits. The goal is to allow enough time to analyze and understand the proposed team member and assess his or her ability to problem solve, mitigate risk and add value.

Who comes to the meeting?

- For the team, anyone who has a stake in the project and considers the selection of this team member critical to their performance, or anyone who has specific knowledge of the deliverables this participant will provide.
- For the proposed team member, the attendees should include the lead personnel who will be doing the work (designer, estimator, project manager, supervisor, etc.), and someone that can speak for the company and make a commitment on the company's behalf.
- The meeting should not include business development people and superfluous executives.

The Decision:

- Make the decision quickly. Successful teams have had the interviews over a day or two day period and made the decision at the conclusion of the meetings. This establishes an atmosphere of an action-oriented team focused on results and advancement. The more time that expires between the interview and the decision, the more details fade and memories fail.

Note: this is an opportunity to display and establish the desired culture of trust.

- Tool: teams have been successful using Choosing by Advantages to organize, gain consensus, make the decision, and document the process and information.

The Follow-Up:

- A quick retrospective with the successful new team members has proven beneficial.
    - Why were they chosen?
    - Where could they improve their process?
    - What were the concerns of the team, and how can they be addressed?
    - What about the process from the point of view of the interviewee could be improved?
    - What concerns does the newest team member have, and how can they be addressed?
- Dive deep with unsuccessful invitees providing a transparent glimpse into how and why others were selected. Ask questions similar to those above.
- It is valuable to the invitees to hear back from the interview committee. This is an opportunity to learn. Take interview notes and share the decision-making outcome to help those who did not win improve. Be candid and fair. It is also valuable for the winning partners to understand why they were selected. This can help establish expectations.

TEAM PARTNER SELECTION

Quick Reference

For additional readings and information, please see the below information.

CHAPTER 21 – TEAM PARTNER SELECTION

Additional Readings

Contract or Co-Operation Insights from Beyond Construction Collaboration - The Honda Experience

Integrated agreement on one page

Last Planner and Integrated Project Delivery

CHAPTER 22

CHOOSING BY ADVANTAGES

1.0 Why

When applied appropriately, Choosing by Advantages (CBA) allows for visual and transparent decision making. It also aligns with the desired values and culture of Lean/IPD and allows teams to emphasize a project's value to its stakeholders (customers and clients). With CBA, decision makers can reach consensus, focus on outcomes and understand all of the factors considered during the decision-making process.

CBA is a decision-making system that acknowledges all decisions are essentially subjective–but then guides the participants towards basing the subjectivity on objectively discovered and documented facts.

2.0 What

Many decision-making methods or systems are flawed, and can thus lead to poor decision making.

CBA is a decision-making system that acknowledges all decisions are essentially subjective–but then guides the participants towards basing the subjectivity on objectively discovered and documented facts.

Jim Suhr, the creator of CBA, explains: "First, we teach people how to use correct data. Second, we teach them how to use data correctly."

Within the CBA system, language is very important. Five major CBA terms are defined as:

- Alternatives are people, things or plans from which one will be chosen.
- An attribute is a characteristic, quality or consequence of one alternative–one person, one thing or one plan.
- An advantage is a difference between the attributes of two alternatives.
- Factors are parts of a decision–such as a canoe-weight, stability or color. Factors contain data that are required for making a decision. (A factor is not the same as an attribute).
- A criterion is a standard, rule or test on which a judgment or decision can be based. A criterion is a decision that guides further decision making. The meaning of the word criterion is not the same as the meaning of the word factor. (They are also not attributes or advantages.)

CBA is based upon the following four principles:

1. **The foundation principle of sound decision making:** Sound methods base decisions on the importance of prospective differences among the alternatives–not factors, criteria, goals, roles, categories, objectives, attributes, pros and cons, and so forth. (This principle was recognized and validated at least three centuries ago.)
2. **The fundamental rule of sound decision making:** Sound methods base decisions on the importance of advantages–not advantages and disadvantages. (An advantage is a difference between the attributes of two alternatives.)
3. **The principle of anchoring:** Sound methods anchor decisions to the relevant facts. (In the CBA vocabulary, methods that do not base decisions on the relevant facts are called unsound methods.)
4. **The pivotal (critically important) sound–decision-making principle:** Engineers, architects, leaders in organizations, and so forth are professional decision makers. They need to learn and skillfully use sound methods of decision making.

Choosing By Advantages Study of: Heating Hot Water System					
		Alternative 1 Central Plant Heating Hot Water System		Alternative 2 Distributed Heating Hot Water	
Factor: Square feet of Mechanical Space Required					
Criteria:	Attribute	3200 square feet		5100 sq ft required/17 rooms	
	Advantage	1300 Sq Ft.	2		
Factor: Access for Maintenance					
Criteria:	Attribute	Outside secure perimeter		Inside secure perimeter	
	Advantage	Outside rather than in	4		
Factor: Quantity of Boilers & Standby					
Criteria:	Attribute	3 duty plus 1 standby		20 duty +7 Standby	
	Advantage	Less total boilers	5		
Factor: Ability to do Boiler Stack Heat Recovery					
Criteria:	Attribute	10% increase in boiler efficeincy		Not required	
	Advantage	Reduction X therms	8		
Factor: Pumping Energy					
Criteria:	Attribute	More required due to long distribution runs		Less required due to shorter piping runs	
	Advantage			500,000 KwH per year	10
Factor: Construction Schedule					
Criteria:	Attribute	Longer due to site distribution		Shorter - no site distribution required	
	Advantage			2 weeks	1
	Total Importance		19		11
	Capital Cost				

Jim Suhr, the creator of CBA, explains: "First, we teach people how to use correct data. Second, we teach them how to use data correctly."

3.0 How

CAUTION! CBA must be facilitated by someone trained and practiced in CBA. The process can appear to be deceptively simple, but if it is applied incorrectly, it will yield unsound results.

The facilitator and participants should be aware of and guard against gaming the system to railroad a decision into a predetermined outcome.

It is recommended that active participants in a CBA effort attend a one-hour introduction to CBA session that is facilitated by an expert user of the system.

4.0 When

CBA often is used when multiple variables need to be considered to make an informed decision. This may mean multiple solutions exist but a team can't determine the best outcome. This process is often useful when various constituents are focusing on their individual needs and not those of other stakeholders. CBA often leads to alternatives previously not considered as participants gain a deeper understanding of the attributes, factors, criteria, and advantages. This is an excellent tool to document the reasons behind decisions, particularly if parties not involved in the process need justification for these critical decisions.

CBA often is used when multiple variables need to be considered to make an informed decision. This may mean multiple solutions exist but a team can't determine the best outcome.

CBA offers multiple ways to reach both simple and complex decisions. To be effective and sustainable, CBA should be applied to any decision facing a team. Teams that frequently use CBA readily build a trust and familiarity with the system.

CBA works well when teams are assessing mutually exclusive alternatives (i.e., different HVAC systems or structural frame types for a building). It also works well when prioritizing resource allocation such as how to best apply labor resources or which value-add options should be adopted to generate the most savings.

References

The Choosing by Advantages Decisionmaking System, Jim Suhr

One can become a Certified Masters of CBA through Jim Suhr's training program offered periodically.

CHOOSING BY ADVANTAGES

Quick Reference

CHAPTER 23

PROJECT CONDITIONS OF SATISFACTION (COS)

1.0 Why

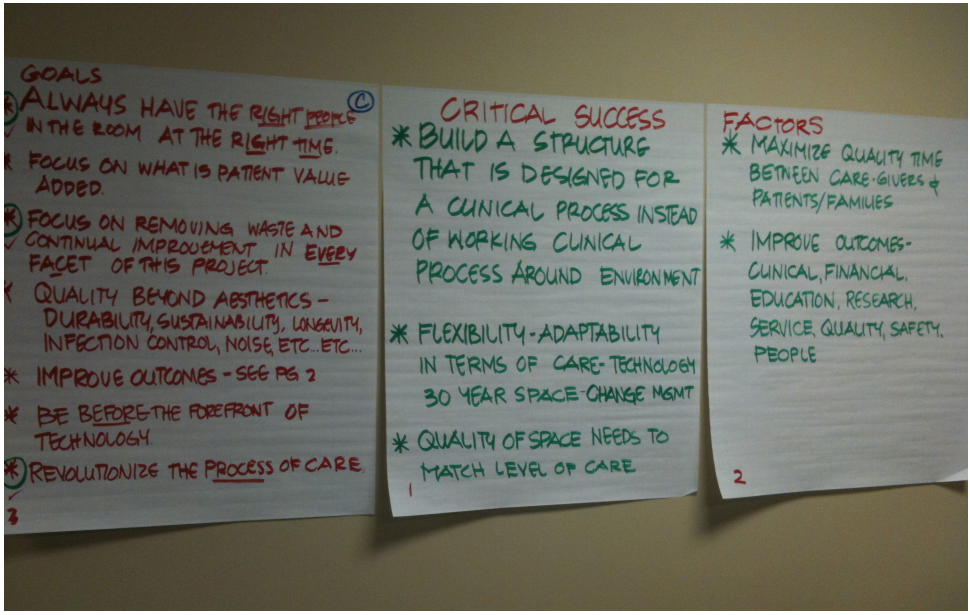
Lean/IPD Projects have been shown to out-perform traditionally delivered projects because there is a focus on alignment of interests, organizational integration, and agreement on project priorities for all parties involved. These project priorities are called Conditions of Satisfaction (CoS) in Lean/IPD Projects. These CoS guide decision making throughout development and implementation. When consensus is difficult to reach, these conditions become the measuring point from which to decide.

The Project CoS define what "success" means for the project team.

Co-developing Project CoS is a key element for developing and maintaining stakeholder alignment.

While a project has cost and schedule goals important for project success, CoS are co-developed to keep the Project Team aligned on additional important criteria the team believes to be critical for Project success.

CoS are the criteria that the team uses to make decisions, develop a common language for collaboration, define expected behaviors, drive team culture, and work together to achieve positive outcomes. Well-designed CoS ensure that all participants are fully engaged with their labor, talents, and experience. With CoS, everybody wins.



While a project has cost and schedule goals important for project success, CoS are co-developed to keep the Project Team aligned on additional important criteria the team believes to be critical for Project success.

2.0 What

Each CoS is a commitment, and all team members are responsible for delivering according to the CoS. By agreeing to and signing up to the CoS, the project team members make a Reliable Promise to one another. This behavior is aligned with the culture that needs to be present on a Lean/IPD Project.

The Project CoS define what "success" means for the project team. They are co-developed by the owner/client and the project partners. The CoS add value to the

client and to the Project Team. They must be measurable in some fashion. This does not mean each CoS needs to be a highly mathematic objective assessment; however, each CoS does need to clearly explain how it will be measured and how it will be known if it has been met (i.e., impeccable coordination that results in no field conflicts or system compromises).

Typically there are eight to 15 CoS established. Usually one CoS will address a budget objective, one will address a schedule objective, and one will address a safety objective. Other options for CoS might be:

- Everyone is profitable (It may be good to get this out in the open and get collective alignment.)
- The number of months in which the project is delivered
- Number of RFI's
- Number of Change Orders
- Number of punch list items
- Percentage of below market cost
- Percentage of operational cost improvement
- Percentage improvement in productivity
- Rapid improvement
- Exceptional teamwork
- Quality at acceptable levels the first time: As measured by:
    - No program schedule impacts due to constriction quality
    - No unplanned factory impacts
- All schedules developed and executed using the Last Planner® System
- Total Project Transparency
- Strong Stakeholder Involvement
- Rapid Mitigation Existing Condition Discoveries

The CoS should be continually reviewed against the progress and learning of the team to ensure that the CoS remain relevant.

Do not rank the CoS in order of importance. The fundamental truth of a CoS is that it must be met; therefore, all of them must be met. Ranking CoS simply creates opportunities for the team to neglect one or more "lower ranking" conditions.

The CoS should be continually reviewed against the progress and learning of the team to ensure that the CoS remain relevant. One way to do this is to include a graphic on dashboards or other visual management tools. It is acceptable for the CoS to evolve during the life of the project – what's important is that there is open communication on this subject among all the stakeholders. Equally important is ensuring that there is collective agreement on the changes as they happen. This is also true of the methods of measuring whether the CoS have been met. Conditions may be met early and retired as the project progresses.

There may be a risk and reward tie to the CoS. The team should be rewarded for meeting them, and there should be some penalty if they don't. The risks and rewards can range from simple and elegant to complex and convoluted depending on project duration and contract structure.

Consider using tension-based language in framing the CoS. For example: "Needs to impress visitors as they approach and enter the building and yet not overwhelm the other buildings in the neighborhood."

3.0 When

CoS should be co-developed as soon as possible, but should not be finalized until all the key players are engaged to have input and agree to the CoS. Typically it gets harder to add new or modify existing CoS the longer the project goes on. Some owners attach the CoS to the contracts and tie the ability to earn added profit to meeting the CoS, or the inability to meet them to reductions in profits. Be wary of having

too many CoS. Focus on what is critical and what would cause the project to be a failure if it does not happen.

Once the CoS are developed, make sure they are widely and regularly communicated to the team. If teams are co-located, have CoS publicly displayed on the wall where they are easy to find and to read.

Measuring how the team is doing against the CoS should be done as often as is reasonably possible. There should be a process in place to ensure the team responds to negative deviations from the CoS.

Quick Reference

The Value Proposition 19

Risk and Opportunity Register 95

Team Partner Selection 117

For additional readings and information, please see the below information.

CHAPTER 23 – PROJECTS CONDITIONS OF SATISFACTION

Additional Readings

An Empirical Examination of The Relationship Between Lean Construction and Safety in The Industrialized Housing Industry

Competition and Collaboration are not mutually exclusive

Contract Incentives to Improve Project Optimization

Developing the True North route map as a navigational compass in a construction project management organization

Implementing Integrated Project Delivery on Department of the Navy construction projects

Kaizen and Job Satisfaction – A Case Study in Industrialized Homebuilding

Owner Perspectives-UHS

CHAPTER 24

THE SHARED RISK/REWARD BUSINESS DEAL

"The Deal" is a unique business construct in the Lean/IPD environment that attempts to align all project participants to a shared project goal, called Conditions of Satisfaction (CoS). The Deal ties the profits of several project participants to the outcome of the entire project rather than to individual performance. The intent is to open the eyes of the participants to the waste that has been generated by the silos of previous contract forms. It also encourages participants to act as one entity, thus optimizing the entire value stream rather than focusing on individual piecework. It is best when a wide variety of project participants participate because they can offer project-wide design and build perspectives.

The intent is to open the eyes of the participants to the waste that has been generated by the silos of previous contract forms.

1.0 Why

The construction industry typically contracts for work in a way that rewards and punishes individual companies for their individual performances. The traditional contracting system is inefficient; so much so that owner/operators typically expect that projects will be late, over budget and inaccurate. The contracting strategy is at odds with the desired outcome. Despite this dysfunction, not much has changed over at least the last 50 years because everyone who is not an owner/operator on the team has learned how to make money from a dysfunctional system. Contractors often must choose between supporting a project's success or their company's success.

This dysfunction causes project participants to choose between behaving in a way that supports project success and behaving in a way that supports individual companies' success. If the behavior that will help the project will cost a company money and the contract they are under does not allow them to be compensated for that effort, the project manager is often forced to choose between helping the project or getting a bad performance review and losing a salary bonus. If the behavior were aligned, we would not have this problem.

In contrast, The Deal encourages collective teamwork to achieve collective success. The financial logic of a shared risk/reward deal reinforces the culture of a single team having a single focus. The Deal also reinforces all the other characteristics of the Lean/IPD model. It encourages the team to collaborate—particularly during a project's challenging or difficult stretches.

The financial logic of a shared risk/reward deal reinforces the culture of a single team having a single focus. The Deal also reinforces all the other characteristics of the Lean/IPD model.

2.0 What

The Deal ensures that project partners establish a shared pool of money (i.e., a Profit Pool or Incentive Compensation Layer). The owner/operator typically guarantees that all true costs will be paid, regardless of outcome, thus removing the fear of catastrophic failure and encouraging innovation.

With an IPD-contract (Integrated Form of Agreement), this pool of money can be structured to directly or proportionately increase or decrease depending on the cost of the work.

Note: Tying the pool solely to the budget essentially ties it to the schedule because the longer a project goes the more overhead costs increase and the more exposed the project becomes to escalation increases. It also ties to the scope because scope typically will be a key element of the Project CoS.

Where other contract forms are in place, this pool will likely need to be created with some form of proxy. Project compensation can be more specifically tied to the CoS through contract performance bonuses or contract penalty for missing targets. This has shown to be helpful in more stringent procurement environments. Aligning the bonus to the outcome encourages teamwork and rewards the team accordingly. It also discourages silos.

3.0 How

Below is the ideal situation that is available under an IPD-contract. The intent here is to present a goal to which a project can strive with other contract models. The difficulty in achieving the ideal situation varies dependent on the contracting model in place. Here is a rough guide to degree of difficulty to construct a business deal that supports everything that needs to happen on the project.

- Integrated Project Delivery Contract – EASIEST OF ALL
- Design-Build Done Right (IPD-like) – FAIRLY EASY
- Multiple Prime or CM At-Risk – MODERATELY CHALLENGING
- Design-Build Done Wrong (Des/Bid/Build-like) – HARD
- Design / Bid / Build – HARDEST OF ALL

The intent of the business deal is to directly motivate the business owners, key project team leaders and financial managers to achieve project goals. It is not to directly motivate last planners and support staff. By motivating the business owners and key team leaders, they then become a resource and advocate for changing and aligning the behaviors of their staff with the needs of the project. A top down buy-in from each organization makes adoption much easier.

The team established four buckets of cost:

- Owner direct cost not at risk to the team
- Total project hard and soft costs including home office overheads
- An appropriate project management team contingency
- Aggregated team profit

The last three buckets combine to become the Current Working Estimate (CWE).

The owner/operator should set a project investment threshold from which the team creates a target cost and can use Target Value Design to meet the target. The collaborative team works together to discover the detailed project requirements and meet this target through innovation. A detailed CWE is established and validated between owner/operators and partners. An initial target is created that is a meaningful stretch, yet attainable.

One key dynamic to create is to have the designers to be at risk for project failure during construction and for builders to be at risk for not informing the design well enough during design. This will create a significant need for collaboration among all partners and will require input and respect across traditional responsibility boundaries. This is a key benefit to the owner as the team is now responsible for improving the communication between designers and builders to avoid the typical causes of project change orders and delay. This risk structure can be particularly challenging for a Design/Bid/Build contract, as the team is not complete during the design phase.

One key dynamic to create is to have the designers to be at risk for project failure during construction and for builders to be at risk for not informing the design well enough during design.

4.0 When

Most Lean/IPD teams solicit business terms input during the Partner Selection process. This helps define profit needs and personnel unit costs in a competitive environment even though the project details are not sufficiently mature to transfer risk.

It is crucial that the project risk/reward criteria link directly the project scope in the project CoS. This is a critical timing issue among all parties. If a project is not sufficiently defined, partners may be subject to undue risk, resulting in inflated contingencies and unwanted protectionist practices.

Teams should create the target and associated profit pool ownership as soon as there is validation around the CWE. By doing this, teams can define the individual ownership of the profit pool, thus clearing the way for partners to assess the project costs. By doing this, teams minimize scope hoarding and scope avoidance. The best project partners assume the appropriate work without concern for impact to profit. This

helps align scope with capability, allows scope to be aggregated and to be shifted as the needs change.

Project teams new to partner selection should seek advice from companies experienced with Lean/IPD and consult with legal and insurance experts.

Stretch goals embedded in the business deal create tension that drives innovation. These goals should be significant and not limited to 2% or less. The goals should recognize the significant waste embedded in the system and encourage partners to think differently about the way they do business, both individually and jointly. The shared savings should be commensurate with the willingness to take risk and the effort required to meet those goals.

Contingency should be determined based on risk, not historical experience. Teams should strive to identify and create mitigation strategies for any known or perceived risk. A portion or all remaining contingency should be shared with the partners to incentivize all parties to efficiently resolve risk issues.

While the premise of this article is that the owner be fully involved and engaged with the partners in all aspects of the delivery, the owner does not always need to be a participant in the business deal. There are contract models where the above structure is entirely within a GC-led progressive Design-Build structure. However, the owner/client still needs to be an engaged participant in the project, and it is particularly vital that before the final cost is agreed to the owner must have a clear, robust project CoS.

Quick Reference

Lean Construction Defined 27

Partner Selection 117

Conditions of Satisfaction 133

For additional readings and information, please see the below information.

CHAPTER 24 – THE SHARED RISK REWARD BUSINESS DEAL

Additional Readings

5.4 Case Studies of VDC for Lean Project Delivery

BIM and Value Stream Mapping Robert Mauck

Commercial Terms to Support Lean Project Delivery

Competition and Collaboration are not mutually exclusive

Conflicts Between Contract Law and Relational Contracting

Contract Or Co-Operation Insights From Beyond Construction Collaboration - The Honda Experience

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Implementing Integrated Project Delivery on Department of the Navy construction projects

Integrated agreement on one page

Integrated Project Delivery An Example Of Relational Contracting

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Owner Perspectives-UCSF

Project Alliancing A Relational Contracting Mechanism For Dynamic Projects

The Application Of Lean Principles To In-Service Support A Comparison Between Construction And The Aerospace And Defence Sectors

Transitioning to Integrated Project Delivery Potential barriers and lessons learned

Using a design-build contract for Lean Integrated Project Delivery

CHAPTER 25

LAST PLANNER® SYSTEM OF PRODUCTION CONTROL

1.0 Why

Why do Lean projects typically start by using the Last Planner System® (LPS)?

The aim of Lean/IPD is to deliver all of the value promised to the client without the usual waste that typically comes with projects in the built environment. The vast majority of those projects are performed by a group of specialists who are convened for one project. For the most part, those specialists set out to perform their part of the project while seeking to maximize their use of resources. The local optimization runs counter to the optimization of the project as a whole, resulting in poor flow, waste of many types and overburdening of resources. The Last Planner System® brings stability to the project by giving attention to flow while reducing variation in the hand-off of work between the specialists in a continuously improving situation.

2.0 What

What makes the LPS® a Lean system for planning and managing work?

"The intention of the system and the fundamental nature of the practices involved are clear: Produce predictable uninterrupted workflow by creating a coherent set of commitments that connects the work of the specialists to the promises of the project to the client and coordinates their actions.

"This happens in five recurring conversations each designed so the team can manage the network of commitments inside each of their accountabilities."

The Last Planner System®: Conversations that Design and Activate the Network of Commitments, Greg Howell and Hal Macomber

The Last Planner System® brings stability to the project by giving attention to flow while reducing variation in the hand-off of work between the specialists in a continuously improving situation.

What are the five conversations?

People often refer to the conversations as "should – can – will – did – learn" planning.

- Pull-planning for Production System Design establishes what *should* be done.
- Make-ready planning gets the upcoming work in a condition so that it *can* be done.
- Weekly work planning establishes the set of promises from specific people for the work that *will* be done.
- Daily commitment management supports the last planners in staying on track with their promises so that the work *did* get done.
- At least weekly, the last planners take time to *learn* from their performance.

3.0 How

Can the Last Planner System® be used in design?

Yes! While design work doesn't have the hard logic of construction work, it is still accomplished in a network of commitments made among specialists. That network can be designed and managed so that the work that should be done can be done and will be done. Some adaptations have been made.

Why is the LPS® trademarked?

The Lean Construction Institute (LCI) holds a registered trademark on Last Planner®. LCI's purpose in trademarking the term is to take care of the use and meaning of Last Planner and the Last Planner System of Production Control®. There is no intent to prevent people and companies from using the LPS® to deliver their projects. All LCI asks is for people to include the registered trademark ® once in any document, to note that the Lean Construction Institute is the owner of the trademark and to include LCI's website with the attribution, www.leanconstruction.org.

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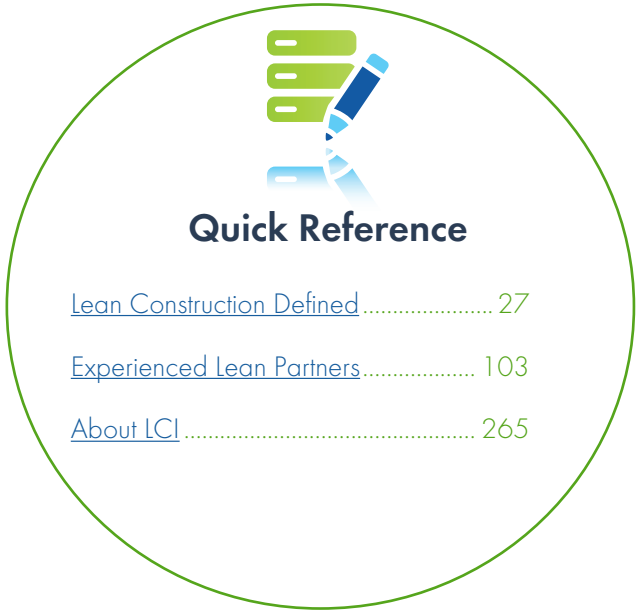

For additional readings and information, please see the below information.

CHAPTER 25 – LAST PLANNER SYSTEM OF PRODUCTION CONTROL

Additional Readings

Phase Scheduling

3 Production Control Principles

9-15-08 Lean Construction Opportunites Ideas Practices

A Lean And Agile Construction System As A Set Of Countermeasures To Improve Health, Safety And Productivity In Mechanical And Electrical Construction

A Project in Review-Owner Case Study-Message to the Facilities Team

Alliance Lean Design Construct on a Small High Tech Project

Born to be Lean

Creating Value A Sufficient Way To Eliminate Waste In Lean Design And Lean Production

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Hard Bid Multi Prime Airport Last Planner

Historical Context of Lean Construction

Jackson Federal Building Case Study

KanBIM Workflow Management System Prototype implementation and field testing

Keynote Case-SHEMC Lessons Case Study

Keynote Case-Temecula Valley Hospital

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Lean Construction Practices and its Effects A Case Study at St Olav s Integrated Hospital, Norway

Lean Construction Prospects for the German construction industry

LEAN CONSTRUCTION THE CONTRIBUTION OF ETHNOGRAPHY

Lean Construction Where Are We And How To Proceed

Lean for Field Operations-Brian Lightner

Lean production, value chain and sustainability in precast concrete factory - a case study in Singapore

Owner Perspectives-UHS

Prefabrication and Pull Planning at Scale-Parkland Hospital

Projects in Review-Revolutionizing Construction Management with Lean and Last Planner

Projects in Review-The Facebook Journey

Rethinking Lookahead Planning to Optimize Construction Workflow

Reverse Phase Scheduling Slides - George Zettel

Site Implementation and Assessment of Lean Construction Techniques

Target Costing - Glenn Ballard

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Target Value Design Current Benchmark

The Combination of Last Planner System and Location-Based Management System

The Lean Project Delivery System An Update

What makes the delivery of a project integrated A case study of Children's Hospital, Bellevue, WA

CHAPTER 26

RELIABLE PROMISING

1.0 Why

Construction projects traditionally encompass multiple companies contracted individually for a short term to one general managing firm. Each company typically comes to the project with independent–and mutually exclusive–goals, definitions, assumptions and generalities. These differences can lead to misunderstanding, incorrect work, rework, poor coordination, over production and missed deadlines. Lean/IPD projects focus on improving relationships and conversations to improve communication, thus reducing Breakdowns through reliable promises.

In the context of Lean/IPD, a promise is a commitment and an agreement.

Reliable Promising and personal commitment-making show respect for people and build trust among team members. Reliable Promising creates ownership and responsibility, and helps shift the culture from one of "holding people accountable" to a culture of "being accountable." Reliable Promising reduces rework, defects and waste–and increases productivity.

2.0 What

In the context of Lean/IPD, a promise is a commitment and an agreement. A reliable promise contains:

- Customer
- Performer
- Timeframe
- Competency
- Mutually agreed-upon Conditions of Satisfaction

What makes a promise or commitment reliable?

- Performer has the resources to deliver.
- Performer has the ability to say no.
- Performer has the time to do it.
- Performer has the authority to agree to it.
- Performer has the competence or access to necessary competence.
- Performer has no hesitation about delivery.
- Performer has planned to do it.

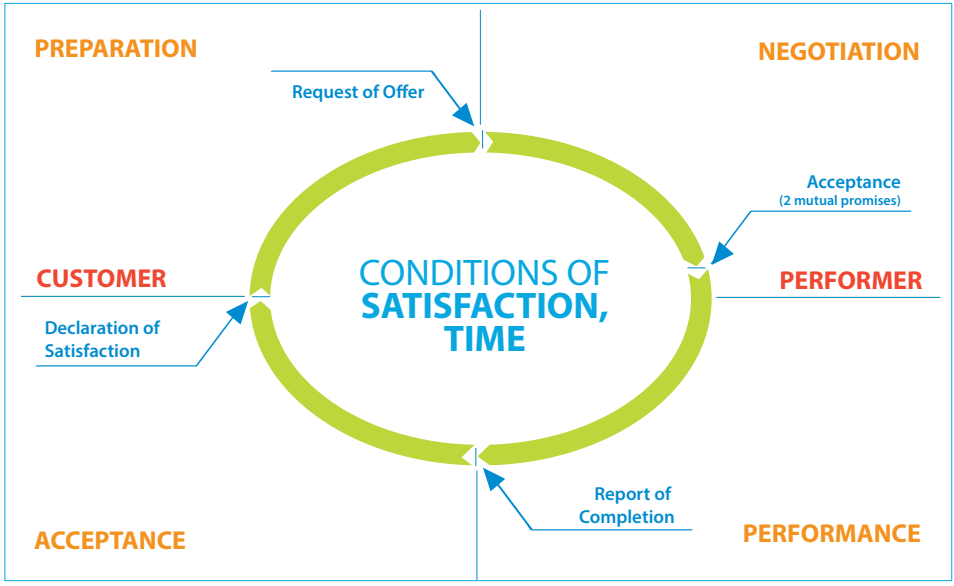
3.0 When

All work that is done is based in commitments. If there is not a customer and a performer for each piece of work, it should be questioned why the work is being done. Reliable Promising and commitment making is every bit as relevant to a Lean project as it is to a Lean organization.

4.0 How

Reliable Promising empowers performers to offer a conditional promise, which leads to negotiation. A conditional promise may be, "yes, I can do that if..." Another option is to provide a counter offer. It strengthens the network of commitments and clarifies the path forward.

Following the Basic Action Workflow model by Fernando Flores, an act is actually two mutual promises–one by the customer of what is being requested, and one by the performer of what they will deliver.



Following the Basic Action Workflow model by Fernando Flores, an act is actually two mutual promises–one by the customer of what is being requested, and one by the performer of what they will deliver.

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The Last Planner System: Conversations that Design and Activate The Network of Commitments, Gregory Howell and Hal Macomber

RELIABLE PROMISING

Quick Reference

For additional readings and information, please see the below information.

CHAPTER 26 – RELIABLE PROMISING

Additional Readings

3 Production Control Principles

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Competition and Collaboration are not mutually exclusive

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Reverse Phase Scheduling Slides - George Zettel

Schedule for Sale Workface Planning for Construction Projects

Social Construction Understanding Construction in a Human Context

Transitioning to Integrated Project Delivery Potential Barriers and lessons learned

CHAPTER 27

CLUSTER GROUPS (PROJECT IMPLEMENTATION TEAM)

1.0 Why

Building projects are complex in terms of systems that work together, multiple companies that interact, and multiple budgets integrated in the overall development budget. Many decisions must be made when developing and delivering a project that meets all of the Conditions of Satisfaction (CoS).

Cluster Groups break up that complexity into an environment of rapid prototyping of solutions and rapid learning through out Distributed Leadership.

It is unlikely that one or a few individuals can make all necessary decisions. Volume of issues, technical skills, input needed, code knowledge, awareness of options, and the ability to study the most appropriate solution would overwhelm a small team. A Lean/IPD project uses Cluster Groups to better manage this arduous task.

Cluster Groups break up that complexity into an environment of rapid prototyping of solutions and rapid learning through out Distributed Leadership. The teams share cross-functional knowledge for problem solving; together they understand the ripple effect of decisions and can therefore make better-informed decisions with less iteration. The Cluster Groups come together in a Big Room environment to share and learn from other team members or clusters. Cluster Groups are most often used as part of Target Value Design (TVD). Through the use of A3 thinking, Choosing by Advantages and set-based design, these clusters can improve predictability while driving value to the Customer.

A single person or company should not design a solution alone, without representation from other project participants. Cluster Groups are powerful because they can get input from many other perspectives–and thus benefit the project.

2.0 What

Cluster Groups are unique and specific to individual project needs. Cluster Groups also change with the needs of the project. They are not all intended to last the entire duration of a program but instead are centered around a body of work to be delivered. Not all projects have Cluster Groups. Small projects may be a Cluster Group in and of themselves. The intent is to batch the work into manageable pieces so the work can progress smoothly and reliably. Small projects may be able to manage this effort as one cluster overseeing all activity. The number of Cluster Groups required for a project will depend on the project's:

- Scope/Size
- Complexity/Constraints
- Risks

Cluster Groups must be multi-disciplinary. Regardless of the topic of the Cluster Group, it will typically be comprised of an owner rep, an end user, an architect/designer, a GC/CM, and a specialty trade contractor. The size of the group should be manageable yet still comprise a broad representation of stakeholders. Teams with high levels of trust allow one member to represent a multitude of stakeholders; this arrangement helps reduce cluster size. Individual team members must be empowered to make decisions on behalf of their company, scope of work, or area of influence. They must also understand their boundaries of decision-making to keep the teams right-sized. Each Cluster Group should have an estimator or person to report to the overall project budget.

Source HKS

A single person or company should not design a solution alone, without representation from other project participants. Cluster Groups are powerful because they can get input from many other perspectives—and thus benefit the project.

3.0 How

Clusters should be formed around whatever grouping is appropriate to the project. Examples include:

- Building system
- Department type
- Discernable chunk of structure or scope
- Subject matter supporting the CoS (environment, community, culture, etc.)

The project team collaboratively forms the groups; the groups must not be dictated by a single person or company. Each Cluster Group defines the objectives and captures innovative ideas that it will bring to the project. They take a deep dive into the body of work they were designated to form around. In a TVD structure, they will often respond to a particular budget goal as well. All Cluster Group goals, ideas and strategies need to be integrated into the Project Team Pull Plan. This will ensure that the team makes decisions at the right time, and that the effect of those decisions on other Cluster Groups and project teams is considered. It's best when decision-making A3 documents are used to define who leads the charge on a particular topic; the date by which the decision must be made should be captured in the A3 as well. The A3 documentation can also inform the rest of the project team about what the individual Cluster Group is working on. All A3s should be accessible and visible to the project team.

Cluster Groups may find it appropriate to work separately from the larger team for various efforts. Their focus of work could demand a location, technology, and intensity that happens outside the Big Room setting. It is essential, however, that Cluster Groups interact regularly. This intentional interaction is the reason for the Big Room to exist. To facilitate this interaction the team may need to use techniques and tools such as:

- Big Room Agenda
- Speed Pulling: Purposeful scheduled time slots of interaction between Cluster Groups

The Pull Plan informs what the Cluster Group will be working on; the Cluster Group responds and informs the pull. But the goal is to pull the work from the activities or decisions to be made, not meet for the sake of meeting. Parkinson's Law states: "Work expands so as to fill the time available for its completion." That is not the intention of Cluster Groups. Cluster Groups are cross-functional teams that complete focused work based on a deliverable established by pull. The use of Restropectives and Plus/Delta can help inform the value of these work sessions.

The Cluster Group will evolve and even disband as a project progresses. Group members may be added and deleted as the deliverables change. If there are no remaining deliverables outlined on the pull for the Cluster Group, then the group may have no further need to exist. As a project enters construction phases and issues arise needing the expertise of multi-disciplinary team members, a Swarm can take place at the site of the work to deal with that singular issue.

Quick Reference

Distributed Leadership 83

Conditions of Satisfaction 133

Big Room 209

CHAPTER 28

HAND-OFF WORK PLANNING

1.0 Why

Construction projects traditionally are made of multiple companies contracted individually to one general managing firm. Each company typically comes to the project with independent–and mutually exclusive–goals, which often results in poor coordination, rework and incorrect work.

Hand-off work planning can be used immediately to improve the reliability of the work plan for near-term work. It is a practical skill that can be used often throughout the life of the project.

Lean/IPD project teams strive to create an environment where the construction process can more closely mirror a production environment. This is accomplished through detailed planning done by those responsible for doing the work. They are encouraged to have clear conversations about their work and specifically how they will hand it off to the follow-on value-adding process. Teams identify and define standard work processes and outcomes–and then improve upon those practices. Using

a Plan-Do-Check-Act PDCA cycle is helpful in this regard and allows for continuous improvement.

The central challenge of Lean/IPD is cultural change. This encompasses how the team thinks about the project, their work, how they behave, how they interact with their fellow team members, manage risk, and how they react to and solve problems. For most team members these behaviors and practices will be different from what they have experienced previously. Most or all of these changes are required to effectively execute hand-off work planning; once learned, they are transferrable to many other contexts of the Lean/IPD work environment. Through transformational Leadership and strong coaching and Facilitation in a Big Room environment, a Lean/IPD team will strive for transparency, one single source of truth, Last Planner® engagement, clear Conditions of Satisfaction, and–most importantly–respect for people and deep, trust-based relationships.

Hand-off work planning can be used immediately to improve the reliability of the work plan for near-term work. It is a practical skill that can be used often throughout the life of the project. Hand-off work planning can be used at least weekly, sometimes daily, or sometimes multiple times per day. It prepares the team to take on the more advanced Lean/IPD concepts like Production System Design.

2.0 What

When performing hand-off work planning, project teams do the following.

Choose a milestone.

The milestone is near-term and has a clear definition. It should be chosen before the meeting is held and communicated in advance to the meeting participants. If this is the first time many in the group have done hand-off work planning, any milestone can be chosen, as long as it is one the participants are familiar with.

Get the Last Planners® in the room.

A Last Planner® is someone who has direct knowledge of the work that is going to be discussed. He or she either performs that work or supervises those who do.

If last planners are not included–or if there are few last planners in attendance–the project can break down. Project teams must know who to invite, and make every effort to ensure they attend. Attendance in person is key. Last planners® cannot attend via

Write the commitments on sticky notes. Each person should write his or her own commitment descriptions (promise to perform, Reliable Promising). This increases accountability.

phone or virtual meeting. Hand-off work planning is an engaged multi-dimensional fast-moving conversation that is intended to lead to personal commitments and agreements.

Define the milestone by asking the following questions.

What is a milestone?

How will the team know when the milestone is reached?

What deliverables must be created for this milestone?

An example of a milestone description that seems clear but is in fact unclear is "building is watertight." Does this mean that 100% of the building is watertight? Or can it be all of the building except where the man hoist is? Is it the last layer of the

waterproofing or is it the entire skin in addition to the waterproofing elements? Is it when the physical installation of the work is complete or is it when the GC has agreed that it is complete or is it when the inspector has agreed it is complete?

This conversation is not optional. It is critical. It drives the rest of the meeting. It is common—and necessary—to uncover differences, misunderstandings, and disagreements on this subject.

Determine the type of work needed to meet the milestone.

Work forwards (forward pass) or backwards (backward pass). Use sticky notes. It is generally best to work backwards (Pull Plan) from the milestone. However, much can be achieved by working forward to the milestone, then moving backward through the chain.

If team does a backward pass, review the plan by moving forward step-by-step. Re-arrange the sticky notes as needed. Repeat until the team agrees the steps of the work are in place and are all connected to the milestone.

When working backward ask:

Are you sure you have no other constraints?

Are you completely released to start work? Look for language patterns like "yes I'm completely released I just need the final spec". If "final spec" isn't in the plan, add it.

When working forward ask:

Does this work release other work to start? Sometimes the other work might be on a pathway not leading to your milestone, but revealing it might lead to team review and uncover a hidden pathway to the milestone you are working on.

Write the commitments on sticky notes.

Each person should write his or her own commitment descriptions (promise to perform, Reliable Promising). This increases accountability. There can be resistance to commitments, but teams must commit. It is important to continuous flow of the project.

Make sure the commitments are sequenced.

Draw lines between the boxes. Make sure it is clear how all boxes are connected and there is an arrowhead at one end of each line indicating the order of the commitments.

Encourage and determine complete descriptions of work, including the name of the person, and the duration of the commitment.

At the beginning, it may be difficult to write complete descriptions and details can be added later. By the end of the session, all commitments need to be complete and connected to all related commitments.

Read all of the participant descriptions and consider the following:

Are the descriptions clear?

What is needed before each commitment can be met?

Is a piece of work missing?

What is needed to release the next commitment to start?

What is needed to allow this commitment to start?

Is a commitment doing more than needed?

Is that other work needed now? If so what follow-on work does it release to start?

Is there a chain of work missing? (Maybe it simply supports a milestone not being planned out right now).

Note: This process can lead naturally to cluster groups being formed to consider unknowns in the hand-off work plan. The team may not have the expertise to resolve the issue that needs study by another group. If an issue is complex or off-topic, add the item to a "parking lot" list to be addressed at another session or by another group.

For the Twitter minded:

#Transparency

#SingleSourceOfTruth

#Conditions of Satisfaction

#ReliablePromising

#Facilitation

#Culture

#ChangingBehavior

#ScheduleRisk

#RiskManagement

#ProductionSystemDesign

#CriticalConversations

#HowToListen

#SmallBatches

Make sure commitments are assigned to people, not companies.

It is a person who will do the work or be responsible for the work and he or she is the point of accountability.

Add durations to the commitments.

Try to limit durations of commitments. Small-batch workflow readily allows for improvement or correction. Challenge any long-duration commitments, especially if the description is short or vague. An ideal maximum duration is five days.

Reach consensus on the completed plan.

Assess the total duration. Determine whether the milestone will be reached in a timely manner.

Conduct a Plus/Delta on the meeting.

Perform execution follow up. Encourage short-cycle corrections and establishment of multiple conduits for communication.

Refer to the Last Planner System® for a deeper understanding of how this hand off work planning can be measured to drive improvement.

Many have found this application to benefit from a coach or project integrator experienced in group facilitation.

Other Needs: Supplies/Characteristics of the workspace:

Big wall or white board

Large sticky notes of many colors (usually one color per company)

Marker pens for connecting the sticky notes

Fine tip sharpies for writing on the sticky notes

Renderings, site plans, site photographs, cardboard models, mechanical layouts, floor plans, as necessary

HAND-OFF WORK PLANNING

Quick Reference

For additional readings and information, please see the below information.

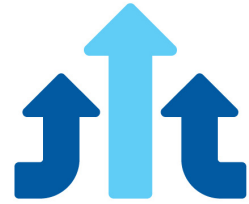
CHAPTER 28– HAND OFF WORK PLANNING

Additional Readings

5.3 Model Based Estimating for Target Value Design

BIM Workshop Outline - Sellen

CHAPTER 29



DAILY HUDDLE

Introduction

When traditional project team members encounter obstacles as they work, their natural inclination is to stop until they can seek input to help resolve the problem, usually at the next team meeting. This interrupts workflow and contributes to teams missing milestones and projects veering off track. By contrast, collaborative project teams have learned that the Daily Huddle is beneficial for synching on near-term goals by verifying that work is progressing as promised–and if not–identifying resources to help immediately.

The Daily Huddle is not a problem-solving or planning forum, but a powerful means for the team to quickly surface and resolve issues.

1.0 Why

The Daily Huddle provides a foundation for driving cultural change and encourages the project team to re-center the Weekly Work Plan or Kanban Plan. The meeting encourages accountability and daily collaboration, as well as facilitates the acknowledgment and resolution of problems.

More specifically, the Daily Huddle provides a venue for:

- Coordinating actions for the day;
- Continuing the planning conversation;
- Keeping the network of commitments fresh and active;
- Letting the team know the status of commitments and where help is needed;
- Openly sharing concerns and risks;
- Identifying constraints so they can be addressed;
- Declaring breakdowns in real time;
- Identifying opportunities to help each other; and,
- Fostering and building teamwork and a sense of shared responsibility.

The Daily Huddle is not a problem-solving or planning forum, but a powerful means for the team to quickly surface and resolve issues. As a result, the Daily Huddle reduces waste by aligning the project team each day.

The meeting encourages accountability and daily collaboration, as well as facilitates the acknowledgment and resolution of problems.

When addressing the group, participants should stand at the Weekly Work Plan or Kanban Board in order to maintain a high-energy session.

2.0 How

The Daily Huddle should be brief, well-organized and led by a fixed or rotating facilitator. The role of the facilitator is to keep the conversation flowing crisply and on track, while ensuring the session is meeting the needs of the team.

The meetings can be held either in person or remotely, dependent upon circumstances, and should be held at a consistent time; ideally at the beginning, end or during a natural break in the day. Additionally, the huddles should be brief, generally not exceeding 15 minutes. However, the period/frequency of the meetings can be adjusted to meet the needs of the team and the project.

Participants should reference the Weekly Work Plan or Kanban Board and come prepared to address:

- What commitments have you completed since our last check-in?
- What work will you complete by our next check-in?
- What are your constraints, as well as help or resources needed?

- What is the availability to the materials, tools, equipment, and information you need to perform your work?

It is vital that the Daily Huddle format be posted in the area where the meeting occurs. If the meeting is held via conference call, the Work Plan or Kanban Board should be readily available digitally. When addressing the group, participants should stand at the Weekly Work Plan or Kanban Board in order to maintain a high-energy session. To improve engagement, a record of attendance also can be maintained.

Urgent issues and questions requiring follow up or deeper conversation often surface during the Daily Huddle. The facilitator should collect these issues in a "Parking Lot" or "Bin List" for rapid resolution. Some teams have found it beneficial to require the resolution of all Bin List items within 24 hours. This acknowledges concerns and maintains urgency without derailing the meeting.

3.0 What

The Daily Huddle is a structured meeting with the primary goal of coordinating promises and re-centering the project team on the near-term plan (Weekly Work Plan or Kanban Board). The meeting, while informal, follows a consistent format and is applicable at any level or phase of the project. It encourages transparency, accountability, and positive peer pressure to perform and not disappoint the rest of the team.

Ideally, the Daily Huddle should be an open forum that provides a voice to all participants, and encourages them to engage with one another rather than report to a designated team leader.

References

Daily Meeting, Agile Alliance
http://guide.agilealliance.org/guide/daily.html

Daily Scrum Meeting, Mountain Goat Software
https://www.mountaingoatsoftware.com/agile/scrum/daily-scrum

It's Not Just Standing Up: Patterns for Daily Standup Meetings, Martin Fowler
http://martinfowler.com/articles/itsNotJustStandingUp.html

7 Mistakes during the Daily Stand-up Meeting, Scrum Alliance
https://www.scrumalliance.org/community/articles/2014/july/7-mistakes-during-the-daily-stand-up-meeting

Daily Check-in Session: Successfully Coordinating Action with Stand-ups, CH2M Hill
https://drive.google.com/file/d/0B6L2W2S0G6RKa1NCT3ZGamdOR0k/view?usp=sharing

For additional readings and information, please see the below information.

CHAPTER 29– DAILY HUDDLE

Additional Readings

3 Production Control Principles

A Project in Review-Owner Case Study-Message to the Facilities Team

Keynote Case-SHEMC Lessons Case Study

Keynote Case-Temecula Valley Hospital

Lean Journey-Lean Transformation of a Company

Prefabrication and Pull Planning at Scale-Parkland Hospital

Projects in Review-The Facebook Journey

Site Implementation and Assessment of Lean Construction Techniques

CHAPTER 30

PRODUCTION SYSTEM DESIGN

Introduction

Lean/IPD project teams strive to create an environment where the construction process resembles a production environment. This is accomplished through detailed planning done by those directly responsible for doing the work. They are encouraged to have conversations about their work and specifically how they will hand it off to the next value creator. Attempts are made to identify and define standard processes and outcomes–and then improve upon those practices. Using a Plan-Do-Check-Act (PDCA) cycle is encouraged to offer flow, predictability and an environment for continuous improvement.

Lean/IPD project teams strive to create an environment where the construction process resembles a production environment.

As they begin to implement the Last Planner® System on their projects, project teams often struggle with how to use the system within the context of their existing and conventionally constructed project schedules. Those schedules are generally overly detailed, make large assumptions, and often prematurely attempt to predict the future in great detail. Additionally, it is generally assumed that scheduled activities will happen as expected months or often years after those schedules are first created.

Production System Design is fundamental to creating Milestone and Phase Plans that are better aligned with the principles of Lean/IPD. Creating Milestone and Phase Plans helps the team achieve project flow—and is a step that is often missed when teams begin to implement the Last Planner System® for Production Control.

Production System Design is the "Plan" part of the PDCA process. It is an iterative analytical process that recognizes the dynamic nature of project plans. It is done collaboratively with the key performers who are directly responsible for the various phases of the project. It should be created for the specific project.

1.0 Why

- It identifies the main phases of work, areas of standard activities within each of the phases, and areas of potential variation.
- It enlists input from the people directly involved in the work to identify critical handoffs and interface points between the phases.
- It provides the framework for implementing strategies to reduce variation.
- It identifies the main phases of work and lead times to start Phase Planning to achieve flow.
- It sets the pace for the work to identify what should be done week after week to maintain flow. It provides the starting point for Make Ready Planning to improve reliability.

Production System Design is the "Plan" part of the PDCA process.

2.0 When

- Teams begin this process at the start of the project to build a conceptual framework for the production system. Teams identify the main project phases,

then revisit and refine those phases as the work evolves to reflect the team's best understanding of the remaining work and the capabilities of the performers.

- Production System Design should be done at the project level to define the overall supply chain, the main project phases, long lead time items, and location breakdown structure. It should be done at the Phase Level to define standard activities and their preferred sequence within each of the phases.
- Teams should identify potential bottleneck trades before finalizing buy-out decisions.

3.0 How

Teams should:

- Collaborate with the people directly responsible for the work. Use PDCA approach to continually improve the details of the production system.
- Begin by identifying the main phases of work at the project level. A phase defines a group of activities of the same nature that releases a group of activities of another nature. For example plumbing and electrical are not phases, but rough-in and finishes are.
- Clearly identify the interface points between the phases of work and the requirements of the elements of the systems in each phase. For example, it is important to consider which areas in the building are served by a particular air handler in order to finalize the sequence of work within the floors in the building and align it with functional testing (this is key for proper location breakdown structure design).
- Identify which phases are unique and which phases can be defined by standard activities. Identify the interface points between unique and non-unique phases.
- Enlist input from the key performers of each phase to identify the standard activities and identify the areas in the project where the standard activities will occur. Use visual tools to illustrate the results (diagrams and flow maps).
- Review the standard activities with the key performers and inspectors and identify opportunities for built-in quality.
- Identify the areas of the project when unique phases occur and identify the interfaces to phases of standard activities.

- Identify the strategies that will be used to set the pace of the work and achieve flow. For example, the team may choose to fix the durations of standard activities and vary the crew sizes to maintain flow (this is known as Takt Time Strategy). Or the team may fix the locations and allow the durations to vary based on the production rates of the crews and the quantity of the work (this is known as the Location Based Management System strategy). Or the team may use a combination of the two strategies. The goal is to achieve flow and strike the right balance between flow and crew efficiency.
- Fill the details for the supply chain for each of the standard activities. Validate the results with each key performer responsible for standard activities. This includes the process to design, coordinate, detail, procure, fabricate, and deliver each of the systems defined by the standard activities in each batch. Adjust your Production System Design accordingly.
- Use this to begin the process of Make Ready Planning (or Lookahead Planning) to identify constraints, prioritize the constraints, and to incorporate the constraints into the weekly and daily workplans.
- Follow the Last Planner System® processes of Weekly Work Planning, Daily Commitment Management (Huddles) and Frequent Lessons Learned. Use the outcomes of those processes to inform and improve the Production System Design.

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Seppänen, O., Evinger, J. & Mouflard, C. (2014). Effects of the Location-Based Management System on Production Rates and Productivity. Construction Management and Economics, DOI: 10.1080/01446193.2013.853881

Seppänen, O. (2014). A Comparison of takt time and LBMS planning methods. Proceedings of the 22nd Annual Conference of the International Group for Lean Construction, Oslo, Norway. June 25th - June 27th, 2014.

PRODUCTION SYSTEM DESIGN

Quick Reference

For additional readings and information, please see the below information.

CHAPTER 30– PRODUCTION SYSTEM DESIGN

Additional Readings

Design of Construction Operations

Flow Driver - A System for Reducing Fabricator Lead Time

Implementing Pull Strategies in the AEC Industry

Lean Design - Process Tools -n- Techniques

Lean Project Delivery System

Lean Project Delivery System

Production System Design - Work Structuring Revisited

Commercial Terms to Support Lean Project Delivery

Discrete Event Simulation Enhanced Value Stream Mapping an Industrialized Construction Case Study

Rethinking Lookahead Planning to Optimize Construction Workflow

Three opportunities created by Lean Construction (new)

CHAPTER 31

CONTINUOUS IMPROVEMENT (KAIZEN STAIRWAY)

Introduction

The construction industry has seen an erosion of efficiency with limited improvement compared to other industries over the past 50 years. The industry has created silos of various supply chain members, introducing significant waste to the system. Individual designers, craftsmen, managers, and suppliers have been isolated and directed to provide only what they have been told, and little has been asked of them outside the realm of their transactional contract obligation.

Integrated/collaborative projects are focusing on the elimination of waste as a means of driving improved value to the process. These teams invite all participants to contribute to the value proposition. Some contracts provide for the sharing of that value increase. Lean projects specifically focus on a process of Continuous Improvement.

1.0 Why

There is a belief held by many in the construction industry that improvement to the metaphorical "legs" of the time, cost, quality and safety "stool" cannot take place simultaneously. Instead, they believe that one should be sacrificed to improve the others. In other words, to improve the schedule and budget, one must sacrifice the overall quality of the work.

The Lean approach directly challenges this belief and encourages a project team to realize that all metrics can improve simultaneously. The Kaizen Stairway (Figure 1) provides a systematic framework to help Lean managers think more precisely about the specific steps needed to accomplish simultaneous, continuous improvement.

2.0 How

In order for improvement to take place, the current state should first be benchmarked. The team Value Stream Maps its current state and defines and collects metrics with respect to time, cost, quality, safety, and morale.

This process documents the current state performance and helps the team identify initial opportunities for the elimination of waste. A facilitator may then ask key team members to brainstorm Plus/Delta items (Figure 2). Delta items challenge the team to define specific problems that should be resolved in order for the project team to take its first step up the Continuous Improvement Stairway.

The facilitator can then engage relevant stakeholders to help populate the ribs of an Ishikawa Fishbone (cause and effect) Diagram (Figure 3). This helps the team graphically identify and capture possible causes that may be leading to an undesirable effect.

The key stakeholders then:

- Roughly quantify and rank causes on a Pareto Chart histogram (Figure 4) so it becomes clear that causes with the greatest impact on the desired outcome need to be tackled first.
- Identify critical causes and subject these to a "5 Whys" analysis process (Figure 5). This process of repeatedly asking "Why" assists team members with drilling down to a root cause so that any proposed countermeasure could permanently resolve a problem.

- Deploy critical countermeasures into a PDCA (Plan Do Check & Adjust) Cycle (Figure 6)—also called a "First Run Study".
- Collect metrics to see whether or not the implemented root cause countermeasure results in the desired improvement.

If the deployed countermeasure results in the desired improvement, the process becomes standardized within the organization until it is clear that team members have a firm grasp on the improved work process, and the process can begin again. The Continuous Improvement cycles are iterative in the sense that every future state becomes a new current state, which then begins the search for the next future state.

The entire Continuous Improvement process should be performed within a culture of respect. This is important because the search for enhanced efficiency without the involvement of team members runs contrary to the cultural mindset necessary to deliver Lean results.

In the more detailed version of the Kaizen Stairway (Figure 7) there is an overlay of two gray bars that shows some of the observed outcomes if improvements are truly Lean. The upper gray bar represents what we would expect to observe on a line-of-balance schedule where a previously disjointed and conflicted schedule of activities starts to flow. The lower gray bar represents what we would expect to observe on a coordinate system, where the horizontal axis represents "cost" and the vertical access represents "importance to the owner".

If the process improvements implemented truly offer improved value to the owner, we should observe a taller importance bar for the same amount of cost, the same sized importance bar for lower cost, or greater importance for less cost. Again, the team will know if their interventions are truly Lean because the five metrics of time, cost, quality, safety, and morale should benefit the overall project long-term (right vertical axis), and waste that was initially embedded in the system should become increasingly replaced with opportunities to generate value (lower horizontal axis).

Collective Kaizen and Standardization

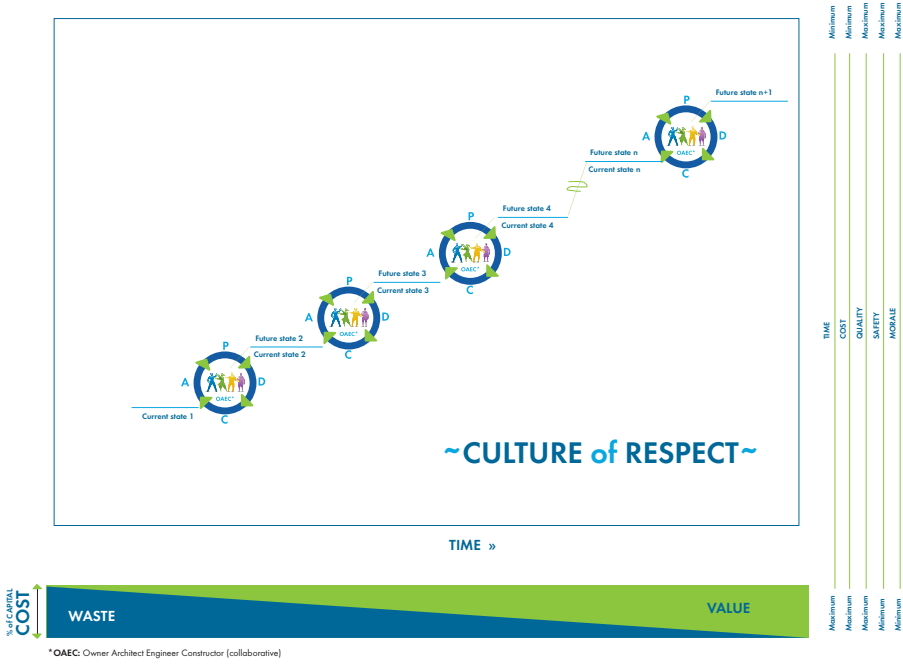

Figure 1. The Kaizen Stairway

Adapted from Rybkowski, Z. K., Abdelhamid, T., and Forbes, L. (2013). "On the back of a cocktail napkin: An exploration of graphic definitions of lean construction," Proceedings of the 21th Annual Conference for the International Group for Lean Construction; July 31-August 2, 2013: Fortaleza, Brazil, 83-92.

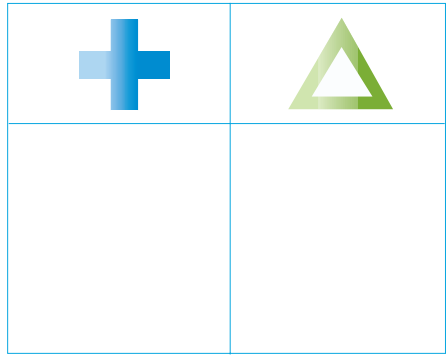

Figure 2. Plus-Delta (+/Δ) Chart

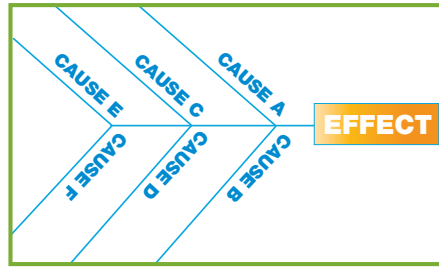

Figure 3. Ishikawa Fishbone (Cause and Effect) Diagram

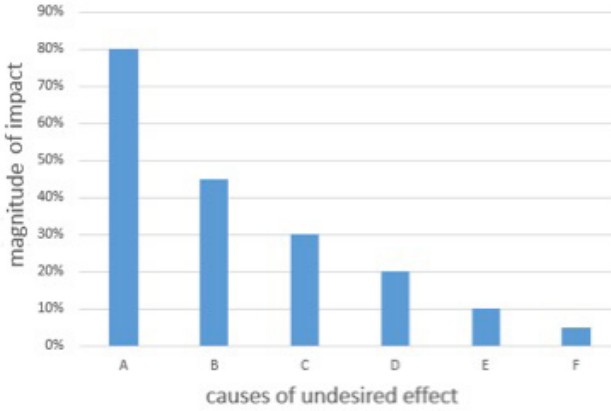

Figure 4. Pareto Chart

	LEVEL OF PROBLEM	CORRESPONDING LEVEL OF COUNTERMEASURE	RESULT IF TAKE ACTION AT THIS POINT
WHY?	Productivity on site is low		
WHY?	Site is too crowded with material inventory	Rearrange materials on site	Short-term solution
WHY?	No one is aware of material management being a problem	Tell them that this is a problem	
WHY?	Laborers are used to solving problem as a "Work Around"	Ask laborers to perform properly	Mid-term Solution
WHY?	Management does not ask laborers for their opinion	Encourage management to ask laborers their opinion	
WHY?	Management is not aware that collaboration benefits everyone	Give them appropriate training to help them percieve the benefits of collaboration	Long-term soluiton

Figure 5. Example of 5-Whys Root Cause Analysis – and drill down to arrive at "permanent" countermeasure.

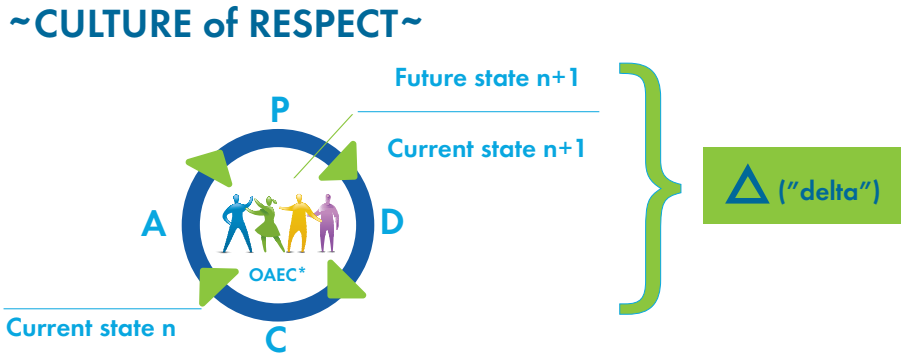

Figure 6. The PDCA Cycle

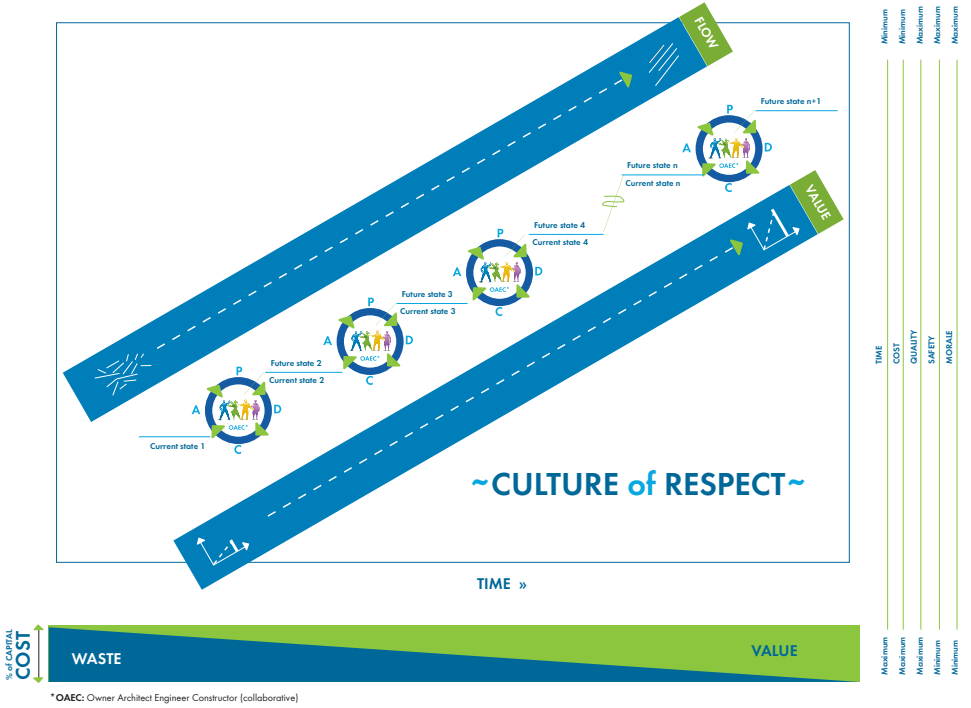

Figure 7. The Kaizen Stairway, with Line-of-Balance flow schedules and Choosing by Advantages value graphs included.

3.0 What

The Continuous Improvement (Kaizen Stairway) process offers a holistic approach to resolving issues with Lean principles and tools.

By using various tools in sequence–the Plus/Delta chart, the Ishikawa Fishbone Diagram, the Pareto Chart, the "5 Whys" and the PDCA (Plan Do Check & Adjust) cycle–the Kaizen Stairway helps teams structure improvement to all key metrics, as waste is progressively excised and converted to value.

Quick Reference

Lean Construction Overview 15

Value Stream Mapping 213

A3 Thinking 223

For additional readings and information, please see the below information.

CHAPTER 31– CONTINOUS IMPROVEMENT

Additional Readings

5.5 Digital Design-Emdanat

9-15-08 Lean Construction Opportunites Ideas Practices

A Project in Review-Owner Case Study-Message to the Facilities Team

An Empirical Examination Of The Relationship Between Lean Construction And Safety In The Industrialized Housing Industry

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Build Lean Transforming construction using Lean Thinking

Contract Or Co-Operation Insights From Beyond Construction Collaboration - The Honda Experience

Contracting for Lean in Design Build

Developing the True North route map as a navigational compass in a construction project management organisation

EM Dirkson Courthouse Case Study

Five Big Ideas of Lean Construction

Generic Implementation of Lean Concepts in Simulation Models-1

High-Performance Building Green Rating Systems

Identification of potential improvement areas in industrial housing A case study of waste

Implementing Pull Strategies in the AEC Industry

Investigation into the nature of productivity gains observed during the Airplane Game lean simulation

Jackson Federal Building Case Study

Kaizen and Job Satisfaction – A Case Study in Industrialized Homebuilding

KanBIM Workflow Management System Prototype implementation and field testing

LCI Congress Presentation 2012-Bagatelos and Lean Stream FINAL

Lean Construction - 2000 to 2006

Lean Construction as a Strategic Option Testing its Suitability and Acceptability in Sri Lanka

Lean Construction Practices and its Effects A Case Study at St Olav s Integrated Hospital, Norway

Lean Construction Where Are We And How To Proceed

Lean Journey-A Journey not a Race

Lean Journey-Value Stream Mapping

Lean principles in industrialized housing production The need for a cultural change

Learning to see the Effects of Improved Workflow in Civil Engineering Projects

Moving on - Beyond Lean Thinking

Owner Perspectives-Disney

PPC2000 Association of Consultant Architects Standard Form Of Project Partnering Contract

Presentation 02-The Big Room-final

Reflections on Co-Location

Safety-A Lean Transformation

Site Implementation and Assessment of Lean Construction Techniques

Standards and Measures - Whole-building Metrics Driving Innovation and High Performance

Target Value Design AIA Practice Digest

Target Value Design Current Benchmark

The Application Of Lean Principles To In-Service Support A Comparison Between Construction And The Aerospace And Defence Sectors

The Impact of Path Dependencies on Lean Implementation within a Construction Company - A Case Study

Toyota Culture

Using Quality Function Deployment in the Design Phase of an Apartment Construction Project - Luiz Gargione

Value Delivery through Product Offers A Lean Leap in Multi-Storey Timber Housing Construction

x03-16-05 Plus - Delta Items-MEPS

CHAPTER 32

ONBOARDING TEAM MEMBERS

1.0 Why

In a project-based industry, it is common for groups and individuals who have never worked together to come together for a program or project. It is shortsighted to believe these individuals will immediately know how to work together and understand the project's Conditions of Satisfaction (CoS).

Onboarding is not a one-time event; it is a continuous process where concepts and culture are always reinforced.

A Lean/IPD approach to project delivery as described in the Lean Construction Overview is a significant departure from traditional delivery. Lean/IPD changes the culture of project delivery by using collaborative tools. Projects are relationship-based; business deals focus on common–rather than individual–goals. By eliminating Waste, Lean/IPD teams provide Value to the Customer.

Onboarding provides a way for team members to reach common levels of learning and project understanding as new team members are added to a project. Onboarding ensures that a team's–and organization's–cultural, behavioral and procedural environments are not disrupted.

2.0 What

Onboarding, also known as organizational socialization, is a way for new employees to quickly acquire the necessary knowledge, skills and behaviors to become effective organizational members. The process also ensures that team members quickly learn these traits to become effective sooner–thus helping to create a High Performing Team.

3.0 How

Onboarding begins before a new project is initiated or before a new team member joins an organization or project. Existing project leaders who are accountable for culture and behavior should conduct onboarding classes to emphasize the importance of change and the processes that will be used to drive that change. All project leaders should take turns leading these classes. It is imperative that all team members are on-boarded and the content administered should be scaled and tailored to the role of each team member.

Involving team members in "learn-by-doing" activities as part of the onboarding process immediately sets the tone for desired collaborative behaviors; builds trust and camaraderie; and transfers ownership of the Lean/IPD process to all participants. Active participation should be interwoven with passive learning to keep the interest alive. Simulations and small-group activities, role playing or problem-solving sessions both teach and engage learners.

Onboarding is not a one-time event; it is a continuous process where concepts and culture are always reinforced. The better this process is incorporated into the project life, the better the results will be. It is not uncommon for a Breakdown to occur if a member firm or individual has not taken the onboarding class.

When leading an onboarding class, team leaders should:

- Clearly explain the Conditions of Satisfaction or guiding principles.
- Explain the imminent changes driven by Lean/IPD.
- Explain the WIIIFMs (What is in it for me?).
- Gather risks and concerns and address them.
- Introduce the class to Lean/IPD concepts.
- Explain the expectations about Lean culture
- Describe the expectations about behavior and explain why they are important to Lean culture.
- Explain the need to listen to the customer and ensure they understand the work that they will perform.
- Explain the Business Deal or any other unique financial arrangements attached to the organization or project.
- Introduce Lean tools in the context of Lean culture.
- Provide basic project or organizational information.
- Provide basic information that team members will need to perform their roles.
- Provide contact information and resources that team members will need to perform their roles.
- Assess readiness at the end of the initial onboarding class.

ONBOARDING TEAM MEMBERS

Quick Reference

For additional readings and information, please see the below information.

CHAPTER 32 – ONBOARDING TEAM MEMBERS

Additional Readings

1 Lean and IPD Panel

Commercial Terms to Support Lean Project Delivery

Lean Construction Prospects for the German construction industry

Presentation 02-The Big Room-final

CHAPTER 33

GO TO THE WORK

Introduction

Too often we think we understand all aspects of a project, but without physical observation, we can actually miss a lot. "Going to the Work" is not simply about quality control or ensuring that a project is on track–it helps us understand the intricacies of how the work gets done in order to identify waste and improve performance.

Going to the Work (called Going to the *Gemba* in original Toyota Production System language) is crucial to improving overall quality control and eliminating waste in the workflow process.

1.0 Why

Going to the Work (called Going to the *Gemba* in original Toyota Production System language) is crucial to improving overall quality control and eliminating waste in the workflow process. It helps participants identify ways to standardize processes and manage expectations from a first-hand perspective, rather than second or third

hand.

Other benefits include:

- Gathering valuable insights to inform kitting, batching and sequencing;
- Improving the planning process;
- Supporting mentoring, training and cross-training efforts;
- Improving safety;
- Clarifying the scope of the project, components or task;
- Empowering participants to understand the process (including cross trades) and suggest ways to improve it;
- Offering a venue to show respect for designers, technicians and craftsmen by asking for their input and offering ways to improve their environment or remove constraints; and,
- Realizing instant improvements to the process.

2.0 How

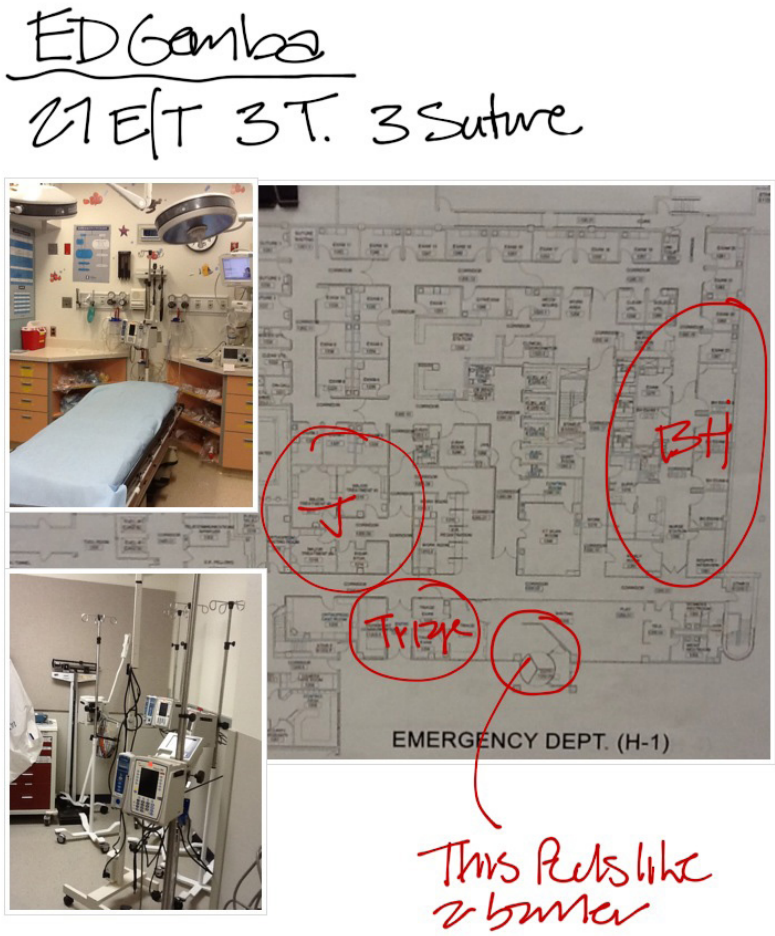
Experienced practitioners employ a variety of methods and tools to assist them in the Go to the Work process. One of the most well-known is the Ohno Circle, which involves observing a project for an established period of time to gain a full understanding of the entire process.

Additional methods and tools include:

- **Video Studies:** Used for processes that are too long or impractical to observe in real time. Instead, the process is taped and watched as a video. The videos can be used later as training aids for continuous improvement.
- **First-Run Study:** Often the first step employed by project leaders to gain a sense of work movements. The goal is to help standardize processes and mark a baseline for continuous improvement.
- **Skilled Craft Lunches**: Provides an intimate setting to search for issues and ideas from trades and other partners.
- **Spaghetti Diagrams:** Involves drawing a pencil sketch of the movement associated with a process. If overly complicated, then the process is likely

inefficient and can be improved.

- **RFID (Radio Frequency Identification):** A form of location-based tracking used to track the movements of materials, equipment or personnel.
- **Mockups:** Can help establish an end-product standard and prove its functionality for end-user stakeholders. Any investment in mockups should be in proportion to the benefits. In some cases, a virtual mockup may be sufficient. However, it is worth noting that virtual mockups will not always yield the practical



The awareness gained from Going to the Work serves to educate the team on how work is performed at every stage of the process, and leads to productive change. Shown: Notes from observations on processes in an Emergency Department.

insights provided by a physical mock up.

- **Prototyping:** The rapid development of a prototype used to prove or disprove ideas.

While observing the work, everyone should understand the goal of the activity, which is to make improvements in a collaborative and constructive manner. The purpose is not to be punitive (Respect for People), but should be based upon a genuine desire to work together for better outcomes.

3.0 What

Going to the Work refers to the act of observing a project's moving parts, from administrative tasks to specific construction processes. It is directly related to the principle of "going slow to go fast" and Continual Reflection. The awareness gained from these observations serves to educate the team on how work is performed at every stage of the process, and leads to productive change. Information gathered can also be used with other tools, such as Value Stream Mapping, A3s, PDCA and Swarming.

Everyone involved in a project can benefit from Going to the Work, from owner representatives, project design leaders, project managers and leadership, to cross trades and less experienced practitioners.

References

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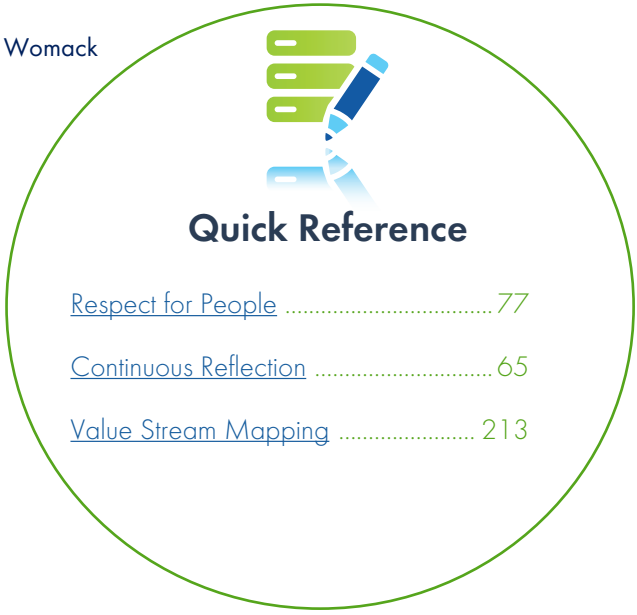


CHAPTER 34

COLLABORATIVE BUDGET MANAGEMENT

Introduction

While traditional project teams have sufficient budget management skills, typically the focus is on individual participants rather than the entire project. Rarely are the details of these outcomes shared with team members beyond those individual firms. This silo method of reporting can lead to surprises down the road as firms review their Cost to Complete (CTC) at different rates, often not identifying overruns until late in the project. These surprises harm team morale, ruin relationships and cause significant discontent among partners.

Participants assigned to a budget cluster should understand the entirety of the document, and all budget data should be defined in common language, and not be trade or partner specific.

Conversely, collaborative teams are encouraged–and sometimes contractually required–to share this data frequently and openly to help understand the overall outcome. This is a challenge for many partners, as systems and methods vary widely for cost accounting.

Although sharing this data requires a serious leap of faith, Collaborative Budget Management is an essential step toward managing a project's CTC.

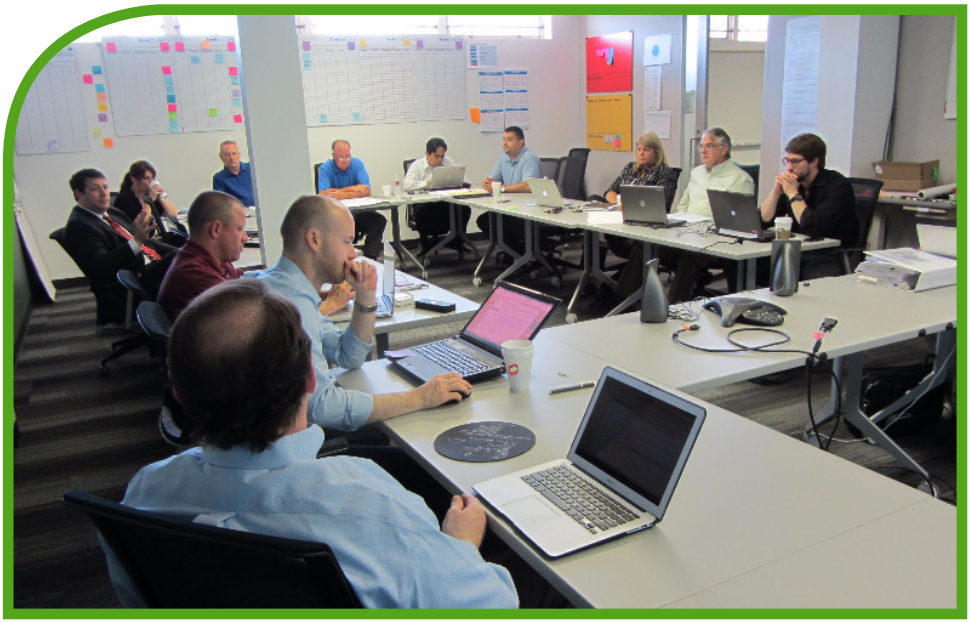
1.0 Why

A Collaborative Budget Management Process is essential for accurately tracking and projecting a project's CTC. Unfortunately, many in the industry do not properly manage the process, or have an unreasonable approach to managing CTC. This frequently leads to unplanned cost overruns.

Cost Forecasting, as well as Risk and Opportunity data, are key components to Budget Management and are necessary for projecting CTC. A proactive Collaborative Budget Management Process creates a reliable barometer for participants to monitor profits and outcomes throughout the duration of the project.

The principal advantages of Collaborative Budget Management include:

- Creates a platform for open, honest and frank discussions about the challenges, opportunities, and progress of a project.
- Promotes CTC awareness.
- Encourages transparency.
- Discourages scope hoarding or avoidance.
- Enables shared procurement.
- Enables shared/consolidated scope.
- Facilitates efficiency discussions.
- Pinpoints cross-trade disruptions.
- Engenders a shared understanding of Current Working Estimate (CWE).
- Encourages shared goals/shared risk reward knowledge.



2.0 How

During the Budget Management Process, the discussion should encourage ownership of budget components, as well as challenge participants and transaction detail. Participants assigned to a budget cluster should understand the entirety of the document, and all budget data should be defined in common language, and not be trade or partner specific.

The Budget Management process should not focus only on actual cost, but should reach a determination as to why actual cost differs from the original estimate.

Additionally, the team should have an understanding of the Added Scope vs. Team Target, which is determined by asking probing questions such as:

- What specific scope drove the change in cost?
- Why did the scope change?
- Did we challenge the scope change in person? With whom?

- What was our basis for challenging the scope?
- Was the decision to add the scope a "whim?"
- Should we have known?

It is essential that there is a solid handoff from the person managing the cost during development to the person handling construction cost details and forecasting, i.e. a solid handoff from Cost Forecasting in Early Project Phases to Collaborative Budget Management. Participants should also define the leading indicators necessary to determine Cost to Complete. If errors are pinpointed, the project team should stop and make adjustments via a Root Cause Analysis.

Other important attributes of Collaborative Budget Management:

- Bad news should be reported immediately, and not by proxy.
- All costs should be identified and shared with all stakeholders, along with cost estimates and target information.
- There should be one point of aggregation.
- The process should encourage open, honest and regular sharing.
- All partners should participate and come prepared with data.
- There should be accurate monthly cost data in real numbers.
- The team should develop a consolidated project cost and make those goals obvious.

3.0 What

Collaborative Budget Management ensures that project teams are accurately reporting the collective health of a project. It is a method for both design and construction to ascertain their Cost to Complete and should be perceived as a management (not accounting) tool.

While Cost Forecasting in Early Project Phases focuses on time and materials on the front end of a project, Collaborative Budget Management focuses on costs through the end of the project. In fact, Burn Rate and Risk and Opportunity data from the early development stages should flow into the Budget Management process.

Necessary components of effective Budget Management include:

- A consolidated, shared, single spreadsheet to encourage transparency;
- Detailed monthly transaction details, necessary via a transaction register to track scope and dollars for innovation, constructability, and integration of the team;
- Risk/Opportunity Log to provide a path back to the budget and to get the project back to target;
- Graphical output for visual reference;
- Established targets provided to all participants;
- Benchmarks; and,
- A "Budget Champion" to collect, collate and present the documents, although they are not necessarily responsible for the data.

The Budget Management process should not focus only on actual cost, but should reach a determination as to why actual cost differs from the original estimate. Additionally, the process should push for ownership and drive accountability.

Ultimately, the Budget Management process provides a good way to tie directly into the "Team Health Dashboard."

For additional readings and information, please see the below information.

CHAPTER 34 – COLLABORATIVE BUDGET MANAGEMENT

Additional Readings

2 Update on Target Value Design 2 TVD Update ppt

3 Production Control Principles

5.4 Case Studies of VDC for Lean Project Delivery

9-15-08 Lean Construction Opportunites Ideas Practices

Analyzing User Costs in a Hospital Methodological Implication of Space Syntax to Support Whole-Life Target Value

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Commercial Terms to Support Lean Project Delivery

Competition and Collaboration are not mutually exclusive

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Projects in Review-Integration of Lean Tools and Takt Planning-4

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Target Costing - Glenn Ballard

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Target Value Design Current Benchmark

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Transitioning to Integrated Project Delivery Potential barriers and lessons learned

Using a design-build contract for Lean Integrated Project Delivery

Using Quality Function Deployment in the Design Phase of an Apartment Construction Project - Luiz Gargione

What makes the delivery of a project integrated A case study of Children's Hospital, Bellevue, WA

CHAPTER 35

PLUS/DELTA

1.0 Why

A primary pillar of a Lean culture is Continuous Improvement. One very effective way to strive for this is through Retrospection. Plus/Delta is a quick, simple retrospective to improve meetings, planning sessions or repetitive activities. By using Plus/Delta, teams can continuously improve meetings or activities and show respect for people by discussing the value of or ability to improve the time spent on events. Using this practice appropriately will help develop and sustain the Lean culture. Over time, participants will ideally develop a regular practice of making timely assessments and adjustments.

Plus/Delta is a quick, simple retrospective to improve meetings, planning sessions or repetitive activities.

2.0 When

Plus/Deltas are typically done in last 10 minutes of a meeting or activity. Projects and organizations that really look to maximize their learning from the practice also use it mid-way through a longer meeting or work session. It can be particularly helpful as a coaching tool when a meeting is going off-track–it will help recalibrate the team around the meeting's objective and potentially help them identify a new objective.

3.0 How

Typically, the facilitator does the following:

1. Plan 10 minutes in the agenda for the Plus/Delta. Make sure the time slot doesn't get used up by another topic. This is not something to be rushed and completed for the sake of completion. Attendees may at first be unwilling to appear to criticize the meeting. They may be afraid to participate. The facilitator should expect to encourage participation until the practice becomes commonplace.
2. Explain to the group every time what a plus/delta is.
    a. Plus: what brought value and how does the team repeat it?
    b. Delta: what can the team change or add to bring more value? How can the team do better?
    c. The team should focus on the process of each particular meeting rather than focusing on people. The facilitator should be prepared to return to emphasizing the objectives of the meeting and how to better achieve these objectives.
3. Draw a line down the middle of a flip chart or white board, label the top with "Plus" and "Delta"
4. Ask the team for pluses and deltas–in action phrase format. They should start their comment by stating whether it is a Plus or a Delta.
    a. Again, all comments should be discussed in action format. If someone says "There was good conversation" as a plus, ask "What action occurred to allow that to happen?" If someone says "we had too many sidebar conversations," ask "What action can we take to prevent that next time?" Try to get to the root cause so the appropriate countermeasure can be determined.
    b. This may take some probing. Some teams go around the table so that everyone provides a plus and a delta, others let the group organically respond. If the room remains quiet, wait for a few minutes. You may eventually need to call on some participants to get the exercise started.
    c. Encourage both deltas and pluses. The intent is to both improve and sustain what is working well.
    d. Don't let people off the hook. Encourage all to speak up. Validate comments with the group to ensure value to most before helping define the action.
    e. Ask in terms of "Who has another plus or delta?" or "What else?" until it is time

The facilitator should expect to encourage participation until the practice becomes commonplace.

to close the session. Then shift the question to "Is there anything else?"

f. Capture these actions on the flip chart. If an action has too many words or is not easy to write, ask the person who said it to rephrase it in a few words. "Translating" is not recommended as often the intent is missed.

g. Ask for owners of each action, along with a commitment date. It is O.K. to decide not to take action.

h. At the beginning of the next meeting, review the status of the actions from the prior Plus/Delta.

Helpful facilitation points:

- No "junk words" allowed. If someone says "the meeting was too long," ask them to define "too long" or to rephrase the statement into a recommended improvement. (For example: "We should meet for 45 minutes.")
- If a participant found nothing to be of value in the meeting and has no improvements to offer, ask that participant if he really needed to attend. What action can be taken for the next meeting to ensure the right participants are there at the right time?

- Everything brought up is fair game. Do not discount anyone's pluses or deltas. Discounting feedback can prevent others from speaking up. Anything brought up that is completely off-topic should then be captured in a "Parking Lot."
- Pay attention to the mood of the group. The group must be open and feel safe to speak up.
- Ensure your application is appropriate for the environment. For very large groups (like conferences) a technical application may be helpful. Generally, more value comes from the group discussing these together.
- Set the goal of not having the same delta from one meeting to the next. Having the same delta means the action was not implemented the first time.

This process can become stale and not add value if not facilitated as described above. There may come a time when the team agrees the meetings are high performing and do not need a Plus/Delta. However, if the meeting value becomes suspect, begin the practice again, perhaps in a more intentional way to bring the value back.

Meetings tend to become habit, the need for the meetings change with time, the length of the meeting may need to change, or any number of factors may alter the value proposition. The Plus/Delta process can help the change occur as needed.

Quick Reference

Facilitation 57

High-Performing Teams 113

Continuous Improvement 179

For additional readings and information, please see the below information.

CHAPTER 35 – PLUS/DELTA

Additional Readings

3 Production Control Principles

x03-16-05 Plus - Delta Items-MEPS

CHAPTER 36

AGENDAS

1.0 Why

Lean/IPD teams are encouraged to work in groups, not silos. This reduces rework by incorporating the needs of many stakeholders before a solution set is presented or moves forward. Though this way of working seems to require many participants attending many meetings, it ultimately reduces the total time spent in meetings. Having an effective agenda respects the participants' time and the value they add to the subject matter. Good agendas effectively move work forward by aligning participants with objective outcomes. Collaboratively-built agendas support the development of a Lean culture. It is equally important for the agenda to be well-facilitate.

Good agendas effectively move work forward by aligning participants with objective outcomes.

2.0 When

Prepare agendas for all meetings, sessions and group events where three or more people are involved. Agendas can be used for singular subject matter situations and can support the weekly plan for co-located teams and Big Rooms.

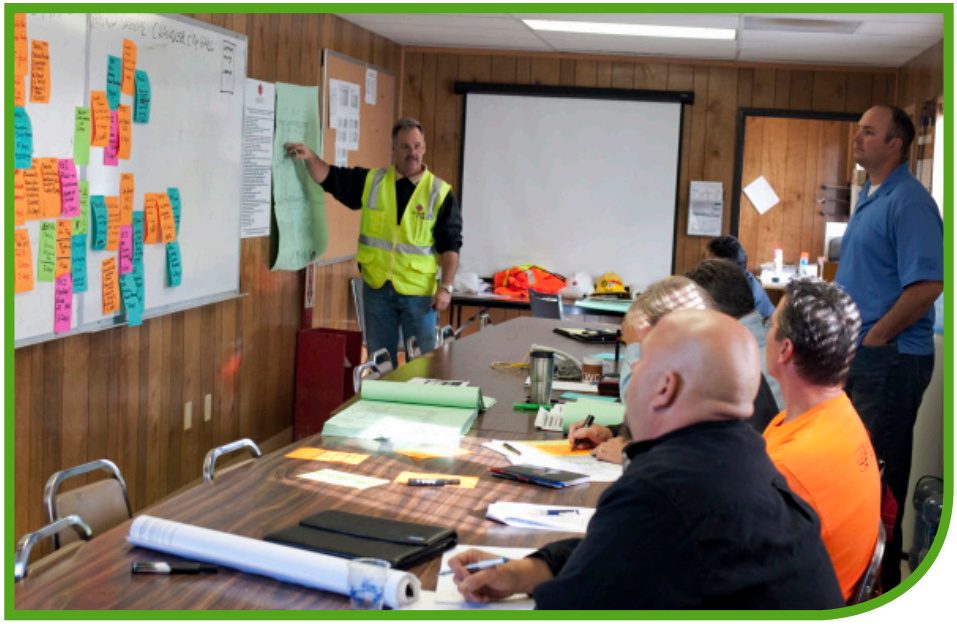
3.0 How

Preparation

- Develop the agenda collaboratively. Involve all participants.
- Prepare the agenda at the end of a recurring session for the next session. Another option is to prepare the agenda earlier in the recurring session, particularly if attendance drops off or participation wanes during the meeting. This is a critical step.
- Publish or post the agenda well before the session meets. This advance posting allows participants to prepare–and also allows others to participate if they feel they will add value.

Elements of the Agenda

- Determine the intention and type of session (planning, decision-making, work, etc).
- Identify the clear expected outcomes to advance the work for each agenda item.
- Identify the customer(s) of the outcome of each item/session and align the expected outcome with their expectations.
- Determine the necessary participants based on their stake in the outcome, their input on the subject matter, and their empowerment to make decisions. When inviting participants, be mindful of the time and other costs they must devote to the meeting.
- Optimize the amount of time needed to drive to the expected outcome while being respectful of participants' time.
- It is acceptable to include time buffers and flex time, but be transparent about their inclusion; and only use them if needed. End items or sessions early if the outcome is reached early.



Use visual cues such as color-coding by type of session, visual timeframes, etc., when appropriate to provide clarity.

- Be mindful of participant's constraints in organizing agenda items.
- Be mindful of participants' time constraints when scheduling back-to-back sessions.
- Open the session with a review of previous plus/deltas for a recurring session.
- When appropriate, lead with Hot Topics. Allow for adjustment to the agenda if needed, and ensure that the group meets consensus.
- Leave time on the agenda to develop the next agenda for a recurring session.
- Include time for plus/deltas.

Tips for Building an Agenda

- Identify the facilitator of the overall agenda and individual agenda items.
- Use visual cues such as color-coding by type of session, visual timeframes, etc., when appropriate to provide clarity.
- Identify participants.

- Include contact information (location, virtual connectivity instructions, etc.) for venue(s).
- Plan to have a Parking Lot to assign actions and owners when off-subject topics arise to avoid derailing the session.
- Be prepared to build a Commitment Log for Action Items.
- Consider the manner in which output of session will be shared. (For example, determine whether minutes add value.)

Resources

Read this Before Our Next Meeting, Al Pittampalli

Death by Meeting: A Leadership Fable...About Solving the Most Painful Problem in Business, Patrick Lencioni

Effective Big Room Agenda, Inside Out Consulting/Kristin Hill

Quick Reference

Visual Management 33

Respect for People 77

Plus/Delta 201

For additional readings and information, please see the below information.

CHAPTER 36 - AGENDAS

Additional Readings

Lean Construction Where Are We and How to Proceed

CHAPTER 37

THE MINDSET OF AN EFFECTIVE BIG ROOM

1.0 Why

An effective Big Room supports cross-functional team collaboration by advancing work and bringing the larger team up to speed on the activities of other groups or individuals. It allows teams to understand their impact across clusters or work groups. The Big Room also provides teams with the time to discuss project-wide concerns such as budgets, hot topics or global changes. The term Big Room refers more to the behaviors and actions of the team than the physical space. The Big Room is more than co-location of people; it is about collaborative behavior and the work it produces.

The Big Room is more than co-location of people; it is about collaborative behavior and the work it produces.

2.0 When

The behaviors and activities of the Big Room environment should begin as early in the project as possible even if the whole team is not yet formed. The frequency of Big Room sessions varies from project to project and within different phases of the project. The team must therefore continuously determine the right frequency and duration of sessions. For example, a half-day per week may be appropriate for a very small project. A complete co-location might be suitable for other situations. Again, the demands of each project will determine the frequency, duration and location.

Over the course of the project, the key participants in the Big Room should and will change according to the type of work being produced and the type of team members who add value to each phase of the project. It is important that the team include the right people at the right time having the right information to do the right work. It is important to discuss regularly this value proposition. Along with smaller monthly changes, the entire nature of the Big Room will change several times throughout the project life.

Although forming a Big Room requires a significant investment of time and money, the Big Room adds value to the project and drives down overall project cost.

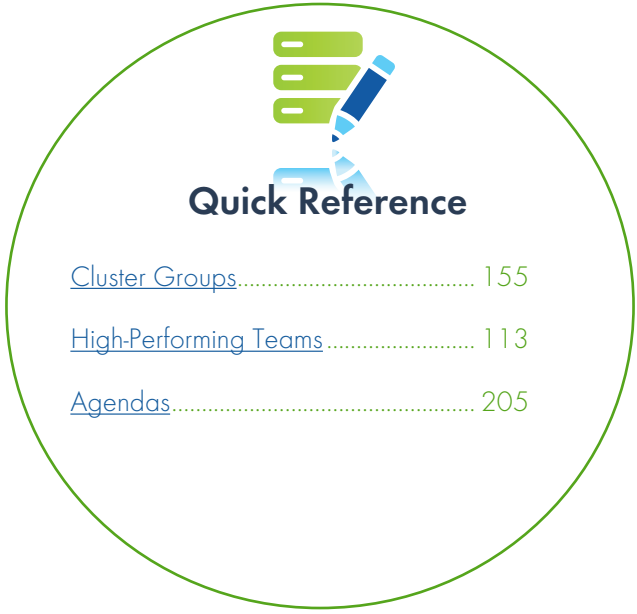
3.0 How

The Big Room is about fostering behaviors that lead to high levels of collaboration and thus to High-Performing Teams. Although forming a Big Room requires a significant investment of time and money, when conducted well the Big Room adds value to the project and drives down the overall project cost. Teams rapidly advance work in a relatively short amount of time with less rework because they have the collective brainpower in the room working together.

Having a well-established, effectively facilitated agenda is crucial to a Big Room's productivity and efficiency. The team should collaboratively create the agenda well in advance of the Big Room session. This ensures that all team members are prepared to advance the work. A good agenda has an expected outcome for the agenda items, timeframes and required key participants. While it is important to have an effective agenda, it is equally important to have it be well facilitated.

Potential Big Room Venues

- Co-Located: Participants continuously located together with continuous collaboration
- Recurring: Participants meet in person on a regularly scheduled, recurring basis
- Hybrid: Combination of in-person and virtual attendance by select participants



For additional readings and information, please see the below information.

CHAPTER 37– THE MINDSET OF AN EFFECTIVE BIG ROOM

Additional Readings

BIM and Value Stream Mapping Robert Mauck

Editorial Lean and Integrated Project Delivery

Integrated agreement on one page

Making Data and Decisions Flow in a Big Room - John Mack and Robert Mauck

Presentation 02-The Big Room-final

Target Value Design AIA Practice Digest

CHAPTER 38

VALUE STREAM MAPPING

Introduction

Traditional projects typically are managed by evaluating and optimizing individual tasks or small sets of work with a single idea or a few individual ideas of how best to perform the entirety of the work. This often leads to inefficiency because the approach doesn't represent all of the details or knowledge about the work. Collaborative teams are encouraged to evaluate the entirety of the value stream; map the process; consider the value of each step; and optimize the process through Value Stream Mapping.

Value Stream Mapping is best used for mapping the flow of value for processes performed multiple times. It is not to be confused with pull-planning, process mapping or hand-off work-planning, which typically are used for mapping a pathway of work and decisions to get to a particular endpoint.

Value Stream Mapping is best used for mapping the flow of value for processes performed multiple times.

1.0 Why

A Value Stream Map (VSM) is a tool that helps individuals visually see and understand a given process rather than simply looking at results. This is vital because understanding the current state of a process is integral to identifying and removing waste.

A VSM enables people to see the flow of value—Customer Value-Added vs. Business Value-Added vs. Non Value-Added—as well as the percentages of each in the process. Non Value-Added components tend to creep into a process over time, and by understanding the process, a project team is better able to design a solution that optimizes functionality and eliminates waste.

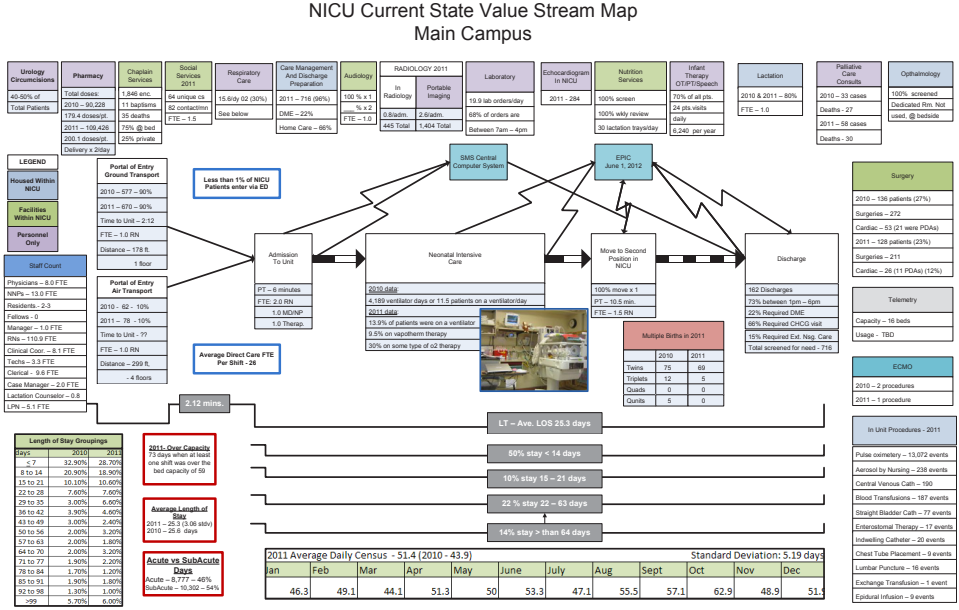
Additionally, a VSM:

- Identifies opportunities for process improvement;
- Identifies pinch points and helps level the workflow to optimize use of resources;
- Encourages continuous improvement philosophy;
- Enables cultural change by allowing people to identify and improve the process;
- Provides a great mentoring tool; and,
- Helps drive toward a goal.

2.0 How

As a critical first step in the development of a VSM, it is important to accurately assess and gain consensus regarding the current state of the process. This requires input from all who actually participate or use the system/process. Systems often are loaded with non-value-added steps; therefore, it is valuable to assess the current state of the process.

The creation of the VSM should begin with the end in mind, be customer-focused, and be completed by someone who is close to the work. Ultimately, the VSM will lead to quick wins or "just do its," but inevitably will need a deeper dive to solve the larger issues in the process, such as A3 thinking and Root Cause Analysis. The process does not necessarily require technology.



Non Value-Added components tend to creep into a process over time, and by understanding the process, a project team is better able to design a solution that optimizes functionality and eliminates waste.

Stakeholders in the VSM development include:

- A facilitator;
- Participants closest to the work; and,
- Customer(s) of the work product.

An example VSM exercise could follow these steps:

1. Assemble a team of stakeholders
2. Identify a process to study
3. Go and see the process (see Go to the Work) and collect actual data
4. Avoid assumptions about the process
5. Map the process visually to establish the current state

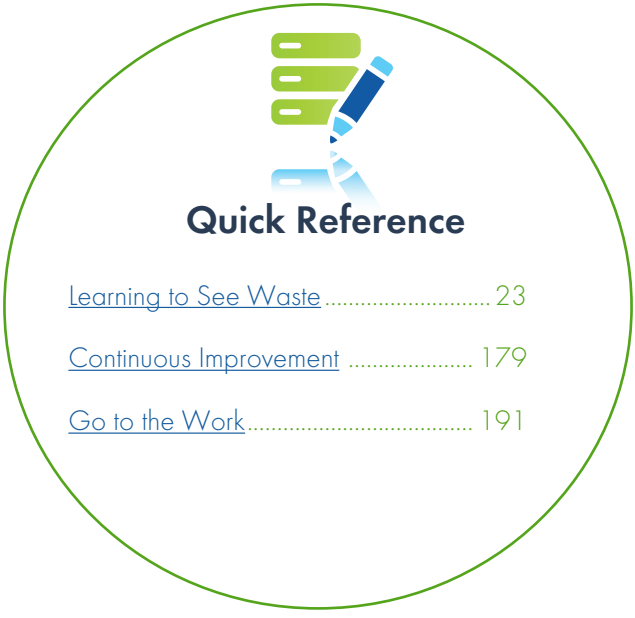
6. Identify and discuss opportunities for improvement
7. Map the process visually to establish the ideal future state
8. Document the process and changes required and follow through

3.0 What

A VSM is a picture (map) of the entire process being studied and includes both material (product/service) and information flows, decision points, handoffs and interactions with other systems. Once a process is accurately documented, the team determines which steps are value-added and which are non-value added. Subsequently, a VSM identifies waste within a process and areas for potential improvement. Seeing the system laid out visually allows participants to remove the waste through step elimination and helps them understand the true value of the process/system.

The VSM is a scalable, actionable exercise and should prompt action to reduce waste in the process. This waste reduction frees up resources for other value-added activities.

A VSM should be Defined, Documented, Distributed and Monitored in order to ensure that it is an actionable document, because the VSM is created as a prelude to action.



For additional readings and information, please see the below information.

CHAPTER 38 – VALUE STREAM MAPPING

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Moving on - Beyond Lean Thinking

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CHAPTER 39

WORK STRUCTURING

Introduction

Work Structuring can be described as a path taken from chaotic work to optimized work. It involves implementation of a number of strategies and tools, including defining standard processes, working to optimize those processes, and seeking one-piece flow; while employing tools such as mistake-proofing and built-in quality. The construction industry must work to eliminate the celebration of heroic behavior—taking on a nearly impossible task and putting the project at risk—by taking a step back and being more intentional about work structuring. The potential exists for significant transformation, resulting in massive improvements in productivity and quality.

The complaint that standardization stifles creativity isn't valid. Rather, standardization creates the platform from which innovation can spring.

1.0 Why

The fundamental grounding of Work Structuring involves the identification of repetitive processes and subsequent structuring into standard work. Repetitive actions can be transformed into standard processes. The complaint that standardization stifles creativity isn't valid. Rather, standardization creates the platform from which innovation can spring. Companies should always seek the new standard. Additionally, the complaint that construction isn't repetitive isn't valid either. While every project itself is a different product, the processes that make up the final product repeat from one project to another.

Standardization and optimization produce outcomes that include higher quality of work, better safety, increased efficiency and higher productivity. These results are sought universally by all organizations.

Foster the improvement process by teaching people to think of work process in terms of mistake-proofing.

2.0 How

As with many Lean approaches, Work Structuring seeks to optimize the whole. For work structuring to be effective, there must first be an awareness of local optimization, followed by an understanding of how the various local systems interact from the perspective of global optimization. Under Work Structuring, a system-centric view is preferable to a product-centric view, with the key focus being the integration of systems. Local improvements must be evaluated within the context of the entire project; building to a global level is a logical progression.

Work Structuring often begins with an effort to standardize repetitive work. However, it is important to note that non-repetitive work is ripe for improvement as well. In non-repetitive work, individuals should seek hidden repetition and find opportunities to optimize and strengthen connections and the handoff of work.

Companies should always seek the new standard by elevating the baseline through innovation. As new innovations arise, the baseline moves in concert to become the new better practice that is spread through the company as the updated standard. This cycle can repeat perpetually and is the basis of Continuous Improvement.

Document the new process in a visual manner and distribute to all workers who will implement it. Post the process so it can be seen and referenced from where the work is being performed.

The contractual terms can help or hinder the ability of the team to optimize the whole and properly structure work. Traditional ways can hinder in optimizing work but relational contracting methods such as an Integrated Form of Agreement (IFoA) can help overcome the methods of the past. An identified standard process can be used as a baseline for continuous improvement. Refining the balance.

Mistake-proofing can be a powerful tool in Work Structuring. A mistake-proof step in a process prevents the one doing the work from performing the step incorrectly. A simple example can be taken from operating a car. In most cars with an automatic transmission, the car cannot be started unless it is in park or neutral. Most of these cars cannot shift out of park unless the brake pedal is depressed. Furthermore, the key cannot be removed unless the car is placed in park. Most cars with a manual transmission will not start unless the clutch is depressed. These are examples of mistake-proofing because they only allow the driver to behave in one, optimal, safe manner.

Built-in-Quality can also significantly shape Work Structuring. Building in quality improves the work by reducing or eliminating the need to check or monitor a process. Most critically, quality occurs at the point where a discrete step in the process occurs instead of at the end of a process where defective work has already taken place.

Traditionally, the work product was inspected in a finished state, meaning that any defect that occurred would have been replicated multiple times. With Built-in-Quality, elements requiring inspection or verification are addressed at the point where they are implemented, often through a mistake-proofing process. An excellent example comes from the original Toyota loom, which featured a device that stopped the loom when a thread broke. Rather than having to constantly monitor the loom or waiting to find that the woven goods were defective, the Built-in-Quality of the device removed the need for monitoring or checking.

3.0 What

Work Structuring involves the following steps:

1. Identify an activity with repetitive work: Carefully examine the work your organization performs. Select an activity that is repeated frequently and that has some number of discrete steps. Start with a common process that is relatively simple, and yet still substantial. This increases the chance of beginning your improvement effort with an easy win, a key component to initial buy-in for the Work Structuring effort. Start small to gain experience through repetition, then take on increasingly difficult and complex processes as your team gains experience.

2. Develop a standard process for executing the repetitive work: Carefully map the steps of the activity in a thorough manner. Involve the people who perform the work and have them work together, using sticky notes to illustrate their discussion. Pay careful attention to detail and be prepared to spend time defining what each step entails. Encourage participants to share their stories of performing the work–what went well, what didn't work as planned, what they wish they had to do the job better. Translate these recommendations into steps for the process. It is important to reach consensus on how to best do the work with the people present in the process. Also, define what you are seeking to improve and how you will measure it. Common metrics include greater installation speed; fewer workers required; less material needed; reduced number of errors, etc.

3. Implement the standard process: Document the new process in a visual manner and distribute to all workers who will implement it. Post the process so it can be seen and referenced from where the work is being performed. Plan for review and training of the standard process and prepare to monitor its initial implementation with all workers. Seek agreement that people will rigorously follow the standard process, even if it is not the way that they have personally performed the work in the past. Monitor the outcome of the process against the developed metrics. Publish and celebrate the results.

4. Encourage innovation from those executing the standard process: Incentivize compliance with the standard by promising the opportunity for innovation. Explain that workers can start with the standard process as the baseline and that when they find a better, more innovative way to perform a step in the process, their innovation will become part of the next standard process and will be spread across the organization. Recognize innovation by publicly celebrating the innovator and the improvement they made. Explain that this cycle of standard > improvement > new standard > improvement will continue forever. Tie the improvements back to the metrics and share the story of how each improvement helps to better meet the metric.

5. Stabilize the standard process, then stress to optimize: Once you are comfortable that the standard process has taken hold and the team has achieved results as demonstrated by measuring against the metrics, begin to optimize the standard process. Reassemble the people performing the work and challenge them to push steps in the process. Work step by step with the intent of maximizing each step until it breaks. Then, stop and assess why the step broke and refine how it is performed. Stress the process until the team reaches an optimal state. As you develop more standard processes, move from one to the next, stressing to optimize. Don't stress more than one process at a time to avoid over burdening the team, but maintain a vigorous rotation so that there is an improvement effort occurring at all times. Then, continue to cycle through various processes. Before you know it, your team won't just be performing the work–they will be perpetually improving the way that they work.

6. Seek opportunities for mistake-proofing steps in the process: Foster the improvement process by teaching people to think of work process in terms of mistake-proofing. Challenge them to structure the process in a manner that reinforces the correct method by removing the opportunity to perform the work incorrectly.

7. Introduce elements of built-in quality to the process: Establish gateways in the process where work is checked for quality. At a minimum, place these at points where work is handed off from one stakeholder to another, both internal and external to the organization. Once established as gateways, work to pull the elements of the quality check upstream into the process. Couple these built-in-quality elements with mistake-proofing to further decrease the chance of defects.

4.0 When

The timing of Work Structuring is key to its successful implementation on a project. As a general rule, the earlier Work Structuring is performed the better, in order to achieve maximum impact. Implementing later in the project can still bear fruit, so it should always be considered.

Work Structuring should be discussed within the Pull Planning Process. Once developed, it should cascade down and be monitored and improved at the weekly work planning levels, allowing it to be refined and improved over time.

Quick Reference

Continuous Improvement 179

Go to the Work 191

Value Stream Mapping 213

For additional readings and information, please see the below information.

CHAPTER 39 – WORK STRUCTURING

Additional Readings

2 Update on Target Value Design 2 TVD Update ppt

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The Combination of Last Planner System and Location-Based Management System

The Impact of Path Dependencies on Lean Implementation within a Construction Company - A Case Study

Using Quality Function Deployment in the Design Phase of an Apartment Construction Project - Luiz Gargione

Work Structuring

CHAPTER 40

A3 THINKING

Introduction

Projects are developed by experts and contributors with various backgrounds and experiences making thousands of decisions. Those experiences inform decisions, whether appropriate or not, and ultimately determine project cost and outcome.

Collaborative projects have learned that waste is often imbedded in those decisions that don't directly apply to the current project Conditions of Satisfaction (CoS). A High-Performing team will create a decision making process and rigorously perform the A3 Thinking decision making process to identify and reduce waste while improving compliance to the CoS.

Done correctly, A3 reporting can provide concise project updates for senior oversight individuals and drive faster input and feedback.

1.0 Why

Teams should use an A3 to improve collaboration, outcomes and the problem solving of specific issues. Due to the size of an A3 (typically displayed on an 11 x 17 sheet of paper), teams are required to focus each A3 on a complicated or broadly compelling decision or a single small to mid-size problem.

Done correctly, A3 reporting can provide concise project updates for senior oversight individuals and drive faster input and feedback. It can also provide a regular snapshot of project health.

Another advantage of an A3 is the historical record of the issue that it provides, along with the rationale behind various decisions or solutions and how the team arrived at them. This can be a useful document to reference later in the project to understand the thinking at various critical points.

A properly executed A3 should reveal the rigor and thought a team used to resolve an issue, thereby increasing confidence with senior leadership. Other benefits include:

- Identifying root causes;
- Creating a dashboard of useful information to reference throughout the project;
- Sharing information and knowledge among team members;
- Reaching consensus among team members; and,
- Promoting deliberative, thoughtful decision making.

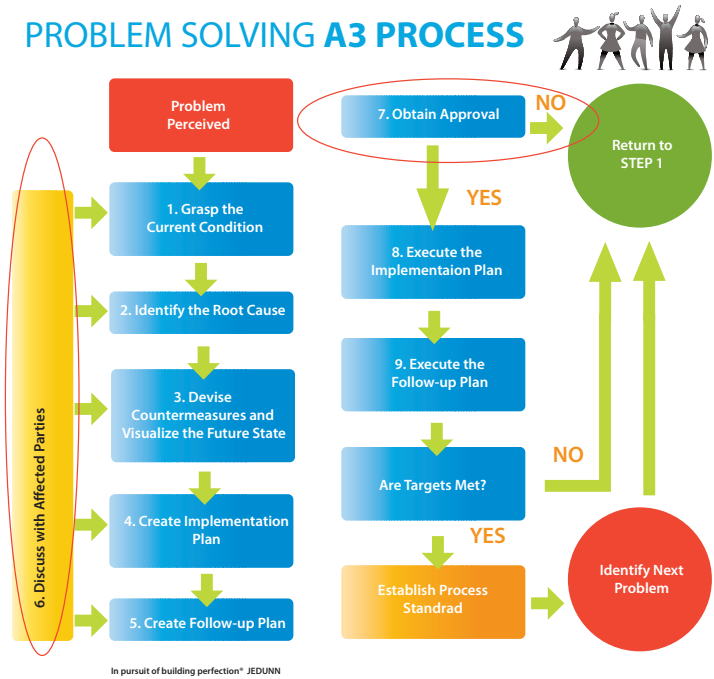
The A3 process is also a good learning tool. Authors are mentored by more experienced reviewers. Everyone involved in an A3 has an opportunity to sharpen their problem solving skills.

A word of caution—producing A3 documents without utilizing the A3 thinking process could still lead to various types of waste.

2.0 How

An A3 is a collaborative document usually managed by a single author or champion who has ownership of the document and oversees its development. The champion drives the process and encourages contributions from team members. A more senior team member or leader serves as a reviewer and mentor, guiding and challenging its assumptions, recommendations, and conclusions.This process is performed with the author in mind so that the information can be consumed in a short time period, thereby yielding sharper thinking.

While there are many ways an A3 process can work, the following image provides a good example of how these steps often look:



Remember that an A3 is a high-level tool that does not prescribe specific steps. Those can be shaped by the champion, reviewer,and team members. With that in mind, below are a few tips for using an A3:

- Prominently define the problem that A3 is addressing.
- Include a list of participants so it is clear who contributed to the process.
- Make sure each A3 has an owner or champion.
- Don't feel compelled to fill up the entire 11 x 17 paper if it's not needed.
- If the problem doesn't fit in the space, break it into a smaller problem that can fit on the paper, or reshape the presentation more precisely.
- Use a platform that provides version control and allows editing by all team members.
- Integrate visuals if they are more effective than text in communicating ideas or illustrating points.
- Update the document as new information becomes available.

3.0 What

A3 thinking is a collaborative process management and improvement tool developed by Toyota. The applications of an A3 are broad. It can be used for problem solving, decision making, planning or reporting of a specific issue from the proposal stage to commissioning. For example, an A3 might be used to decide which system to select, or how to accomplish LEED certification. Often, it is part of a PDCA cycle or DMAIC cycle.

An A3 is an indispensable tool due to the structure, focus, collaboration and consensus it brings to problem solving and decision making. The flexibility of the tool also makes it easy to adapt to a variety of tasks and contexts.

No special software or tools is needed to use an A3. It can be developed using a pencil and paper or commonly-used programs like Excel, Word, and PowerPoint. The only formatting requirement of an A3 is that it be presented on an 11 x 17 sheet of paper.

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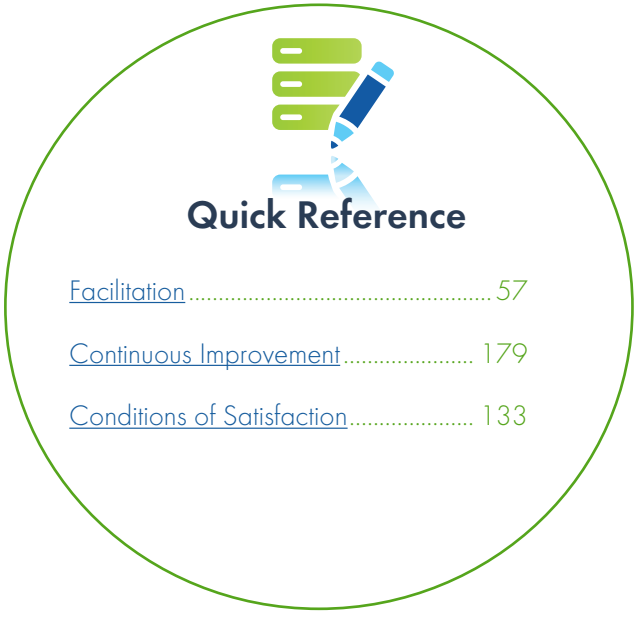

For additional readings and information, please see the below information.

CHAPTER 40 – A3 THINKING

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5.2 Mechanical Systems

5.6 VDC for Lean Project Delivery A3s

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A3 Decision Analysis Using Virtual First-Run Study of a Viscous Damping Wall System

A3-Brief Introduction to Lean Construction

CHAPTER 41

CONCEPTUAL AND CONTINUOUS ESTIMATING

Introduction

A collaborative project environment is intended to solicit and share input from various constituents across the delivery supply chain. To maximize the value of this interaction and to facilitate true value-based decisions, participants must have conversations about solution Set Based Design concepts that lead to the need to understand the cost impact of these decisions.

Continuous Estimating is the effort of regular, frequent updating of the estimate, while also tracking specific variances from the last update.

Understanding these cost impacts requires Conceptual Estimating, a rare, high-value skill that differs from other more common estimating skills. This skill is particularly important in the collaborative environment, where cost information informed by well-grounded time and schedule assumptions is critical to determining which asset solutions

can be provided to stakeholders within the given time and financial constraints.

Continuous Estimating is the effort of regular, frequent updating of the estimate, while also tracking specific variances from the last update.

1.0 Why

Conceptual Estimating requires the constant re-evaluation of a project's value proposition, established from the beginning and updated frequently throughout the process. Ultimately, Continuous Estimating allows constant confirmation of the viability of the project, providing validation of the business case from the earliest stages.

Conceptual Estimating, along with Set Based Design, seeks to validate the business case and answer the question, "What is the delta between what the owner wants and what the business case will support?" Owners need to recognize whether they can ultimately afford the development and whether the required capital investment is appropriate. With Conceptual Estimating, the owner is provided with significant options that can lead to various outcomes, with one possibility being not to proceed with a project.

In order to make accurate, value-based decisions, meaningful real-time understanding of the cost implications of each decision is necessary. Continuous Estimation provides early validation of Want vs. Need–a balancing act with constant tradeoffs. Cost can and should inform design. Understanding the cost implications of design decisions is a valuable tool for designers to better align with owner intent and maximize the value of their design. In many cases, a continuously updated estimate prevents the frustrating and expensive re-design common to capital projects.

2.0 How

Two-skill sets are key elements of Conceptual and Continuous Estimating–one "soft" involving necessary interpersonal skills, and the other "mechanical" having the actual experience and knowledge. It is important to note how these required skills differ from those of a traditional estimator.

Mechanical

At the outset of a collaborative project, the team should develop a detailed cost projection of the "want." When possible, benchmark what is feasible based upon historical experience. This is balanced against what an owner can spend by way of the business case, and a target is then established.

The overall target budget is often broken into systems or components and shared with various cluster groups to use as a guide for further development. This arms them with a tool to inform their design decisions. A format for incorporating up-to-date data and benchmarking is required, so that all participants understand the costs and target in the context of the whole project. It is crucial that all participants understand the makeup and adjustments to this budget tool. Cost data should be pushed out into or inform A3, BIMs, CBAs and other decision-making tools.

Participants must have a rich understanding of what is required for the project without the need of a sketch. Accuracy is paramount, but a balance of the appropriate level of accuracy as the situation demands will ensure less overwork and speedier decisions. This also requires Onboarding the right experts at the last responsible moment to aid in the accuracy, and requires good handoff of ownership of those scopes. Estimators who have problems imparting information should be pressed to explain.

When design decisions are made without understanding the cost, rework is a direct outcome, so estimators should be party to all conversations. Estimate with an optimistic yet realistic view and take the time to document and share risks as they are imagined or discovered.

Continuous Estimating is not re-estimating the entire project on a specific frequency. It is continually reporting out changes since the last report in an easily consumed format, as the design solidifies.

Estimators need to have an understanding of what their project customers need. Information that is too vague is not adequate for a design decision, while too much detail can restrict the process as well. Reference materials, such as photographs or plans from past projects, can help bridge the understanding gap between designer and estimator.

Soft

Communication is crucial. Listening intently is important to understand wants and needs of the owner and intent of the designer. An understanding of the level of detail, value proposition, or level of accuracy is critical. The confidence and trust to share opinions is valuable.

Facilitation of negotiation continues to be integral to the process. Design elements beyond program basics must earn their way into the project, rather than be dropped in and backed out. Therefore, continuous value discussions are required.

The success of this process demands that the owner share its historical knowledge with the team. Many products or processes are unique and have little industry

comparative cost data, but owners should still share this information with builders to better inform set based decisions. Hiding these costs only pushes challenges further into the process when less opportunity for resolution exists.

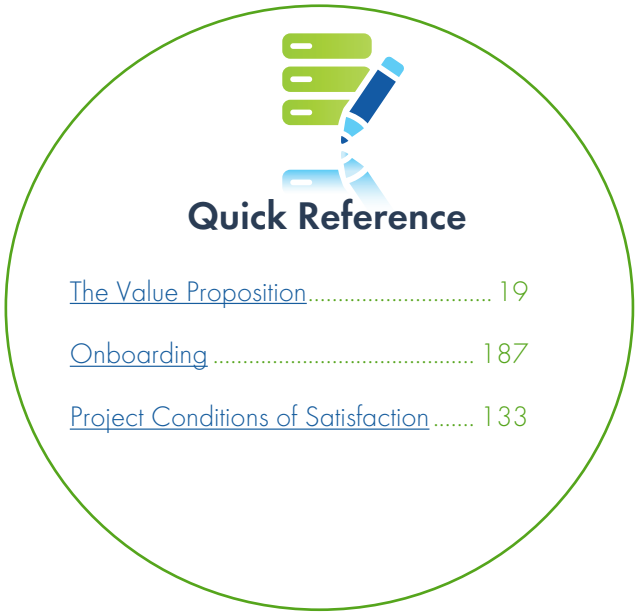
3.0 What

The primary focus of estimating is to create–with an applicable level of accuracy and fidelity–a construction plan that can be successfully executed per the project Conditions of Satisfaction and is key to the Target Value Design process. Continuous Estimating will inform set-based design and reduce re-design by keeping the team aligned with the project intent and designing within the range of affordable solutions.

Early and constant monitoring is necessary to make sure the team stays within its parameters. Early validation of the business case is necessary, in addition to arming the team with information to enable it to make informed future decisions and stay within the business case. Early Stakeholder Involvement (See Early Stakeholder Involvement) is critical to the success of the process and validity of this information.

4.0 Who

All team members need to have a sense of cost when considering design decisions. If those skills are not within the cluster, an expert with the required knowledge should be engaged.



For additional readings and information, please see the below information.

CHAPTER 41– CONCEPTUAL AND CONTINOUS ESTIMATING

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