QA/QC and Efficiency Tactics for Design Professionals

Based on the Book

Lean Tactics for Architects, Engineers and IPD Contractors

Presentation by

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Introduction

- James T. Brown, AIA, ASQ
  - Former USAF Pilot
  - Former A/E Firm Owner
  - A/E Consultant
  - Quality Assurance
  - Project Management
  - Value Engineering
  - Construction Contract Administration

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Learning Objectives

Define top performing firms

Improve the client's valuation of your work

Learn how to apply highly productive Lean project management

Learn how to upgrade quality of design documents

Design for safety

Increase profitability

Top Performing A/E Firm Metrics

- Top firms place creating value for *clients* as their first priority
- Top firms are highly efficient and often have a *net multiplier* of 4.0 (average is 3.3) (4.4 is attainable, but takes a bit more work)
- Top 10% of firms get 28% profit; average profit is 13%, but 30%, or more, is possible
- Top firms use 15-30% less time from design through CCA
- Top firms reduce RFIs by 50%; Change Orders by 95%
- Top firms get 7% higher fees (7.0% becomes 7.5%)
- Average A/E utilization rate is 60%; top firms is 67%
- Top firms bid results are about 5% less than average firms

What Makes Top Performing Firms Different?

Each places high value on responding to client requirements

All are very efficient at Project Management because they have few design documents errors, little redesign, and have a smooth work flow from start to finish

Whether they know it or not, they are employing the basics of Lean Design

Defining "Lean"

"Lean is the use of principals and tools for delivering the most client value, while consuming the fewest resources"

Also:

"Lean is linked methods, approaches and ways of thinking that reduce waste and improve process flow in order to improve quality and efficiency thus enhancing client value"

If we look at our services as the client does, lean client value can be defined as:

"*Any action or process for which the client is willing to pay.*"

Lean Design is the A/E version of “Lean”. There are processes (tools) created especially for A/Es that can be used to significantly reduce waste and improve work flow. All are within the grasp of every firm

What Lean Isn't

- It isn't the new West Coast diet
- It isn't a dissolution of esthetic design; conversely, it gives you more resources to do *better* design
- It isn't instantaneous
- It isn't something that you do once and forget
- It isn't quantum mechanics, but isn't easy

Elements of Lean Design

- Most importantly, Lean focuses on client value
- Lean requires respect for your team, their work and their ideas
- Lean processes help identify and minimize inefficient/excessive work
- Lean requires a robust, effective quality program (2/3 of problem)
- Lean demands smooth design work flow and streamlined construction administration (1/3 of problem)
- It requires quality, design, and project management tools
- It is necessary to know project and firm metrics by maintaining thorough project accounting and reporting
- Lean Design improves construction safety by minimizing ambiguities

Re-Work and Corrective Work

"According to our surveys, our engineers spend over **60%** of their time in changing design and wasted effort"

Don Boles, previously Manager, Corporate Properties Construction for Federal Express

"About 40% of total design and production time is needed to locate and correct errors"

Study by Owens-Corning Fiberglass Corporation. found that 30-50%* of total design time was spent finding and correcting design errors

"About 20% of all project time is wasted through uneven work flow and poor time management"

The right idea then, is to find ways to reduce unnecessary effort

Re-Work Takes Time (and Money)

- For every percent of re-work you eliminate, you add a little less than one point to your profit!
- For instance, if you eliminate 1/3rd of Don Boles' 60% re-work (20%), you can add about 17% to your profit!
- An industry average 13% profit can become **30%!**
- The less corrective work and unnecessary work, the higher your profit and the better job you are doing for your client

Wasted Time

Identifying how time is wasted is important in figuring out how *not* to waste it. Ichiro Toyoda studied his organization for several years and found specific arenas that contributed to wasted time. He called them the seven wastes. A/Es have their own set of wastes

A/E Wastes (Muda)

The following comprise a partial list of reasons for A/E errors

- Technical error waste: incorrect/incomplete drawings, lack of coordination (internally and externally), incorrect dimensions
- Wrong design waste: not to client's needs or requirements, not following instructions, not listening to consultants (or prime), not designing to program
- Starting with inadequate technical information – i.e.; program, geotech, site survey, as-built drawings, master plan, SEPA/NEPA
- Designing over the construction budget
- Misinterpretation of building codes and zoning codes

A/E Wastes

- Excessive design: too many design iterations, plan revisions, drawings and specs, materials, systems
- Client design changes without an added fee agreement
- Reinventing the wheel: not using familiar design elements or processes
- Poor project setup, especially with CAD/Revit/BIM
- Excessive construction contract administration

A/E Wastes

- Consultants trying to keep up with architectural changes
- Misconstruing client instructions, proprietary standards, taboos
- Different people drawing the same details (differently)
- Inadequate written instructions and process guidelines
- Inadequate hardware, outdated software
- Inadequate technical training

Project “Flow”

Flow is the way a project moves from contract signing to project occupancy

- When the project moves smoothly, at a regular and planned rate to meet the client’s schedule (Pull), it is completed with less work, in less time and with better design continuity
- Poor flow happens when there are stops and re-starts, speed-ups and slow-downs, bumps, diversions, zig-zags, and loops caused by corrections, lack of directions, lack of information and other actions requiring design changes and additional coordination and time (Push)

Improving Productivity by 33%
Estimated Possible Reductions

Reduce 60% rework and unnecessary work by 1/3 (33%)

- Improve productivity by reducing error rework (20%)
  - Institute rigorous individual project and program level QA/QC
  - Use highly skilled design personnel
  - Keep design simple (and elegant)
  - Reuse previously successful design approaches
  - Adapt prototype details
  - Properly set up CAD/BIM process
  - More technical training and systems training

Improving Productivity by 33%
Estimated Possible Reductions

- Keeping project flow smooth and to the client's requirements (10%)
  - Do not start design until technical information has been gathered and analyzed
  - Complete design early, get client approval, don't change without good reason
  - Properly interpret client program, needs, desires: "listen"
  - Manage client redesign
  - Improve A/E teamwork/synergy/communication
  - Minimize number of materials, and structural and mechanical systems
  - Better software training; improved hardware
  - Get early, accurate cost estimates; use Target Value Design (TVD)
- Diminish CCA time by better documents and well managed time (3%)

Lean Design Management

Efficient design management is *the* profit engine for A/E firms, therefore A/E project production must be managed with as much care, ability and concern as that required by the technical design solution

Project Management Metrics

- Create and update measurable goals (using Goal Based Planning), in efficiency, profit, schedule, client appreciation, process improvement, design success, etc.
- Use tailored A/E financial management processes and metrics to continually measure progress
- Train your accounting and marketing staff as to what you need and distribute the information to managers and technical staff

“Four” Ways to Improve Profit

- Theoretically there are only 3 *production* ways to improve profit:
  - Improve Project Efficiency. If your firm reduces its work time by 20% (by reducing 60% rework to 40% rework) this improves your **profit to 30%**. Reducing your overall work by 20% also gives you 20% more time for additional projects
  - Decrease overhead (5% less OH = 16% profit)
  - Decrease the utilization rate (57% to 60% = 15% profit)
- A fourth way is to increase fee for the same work (it is independent of production) (7% to 7.5% fee = 20% profit)
- A great thing is that you can use all of these simultaneously!

Improvement Planning

- Deming's Plan-Do-Check-Act cycle (PDCA)
  - Quality Is A Reiterative/Continuing Process
- Plan; how you want to improve a process
- Do; set your plan in action
- Check (Study); measure your results
- Act; modify your plan to improve your previous process.
  - Repeat the cycle until it doesn't pay to do so
- Motorola's Six Sigma has a Better definition with; "Define, Measure, Analyze, Improve, Control" (DMAIC), but is not as memorable
- All quality improvement systems derive from Francis Bacon's 17th century "Scientific Method". There is nothing new under the sun

Planning for Success

- First, identify problems, either on a firm-wide scale, or a project scale, by using a SWOT analysis (strengths-weaknesses-opportunities-threats)
- Then identify the root causes using Kipling and 5 Whys
- Next, make goal based action plan for the biggest problem
- Implement the plan
- After that, check results, if not great, modify and repeat

Define the problem. Solve the problem. Make a plan. Do it. Check the results. Re-plan & repeat as necessary – PDCA!

SWOT ANALYSIS

Primary factors

S — Strengths

- QA system; very low A/E caused change orders (0.3%)
- RFIs reduced by 40%.
- Effective PM Guidelines system
- Firm profitability (23%)
- Most projects completed on schedule (85%) and in construction budget (95%)
- High personnel morale

W — Weaknesses

- Not established in market as big project competitors
- Lack of depth of personnel to do Reviews
- Weak commitment to marketing
- Using older BIM platform
- Not recognized for design skills
- Poor demographics; too few large businesses, not enough government work, school bond issue failed

O — Opportunities

- Investigate design/build partnership(s)
- Investigate Higher Education market; emphasize Project Management skills
- Investigate joint ventures; use quality skills as hook for large job experience
- Reinvest some profit in a great design effort. Make friends with publishers
- Training, Mentoring in QA and PM
- Contact facilities management at Family Hospital

T — Threats

- Economic downturn or market crash
- Changes in drawing and specification technology makes current system obsolete
- Out of town big firm competition.
- Not enough cash to ride out recession
- Not completing Lean process improvement
- Legal action on old projects
- Health of key partners

Kipling and the Five Whys

The Kipling problem definition method comes from a poem by Rudyard Kipling in his "Just So Stories" (1902).

"I keep six honest serving-men

(They taught me all I knew);

Their names are What *and* Why *and* When

And How *and* Where *and* Who."

What, Who, When, Where, How, *Why*

Asking these questions will often unearth a problem's root cause; if not, **ask Why five times**. It will be revealed. I call this Kipling and the 5 Whys, or just Kipling

Goal Based Planning

- Define the *Goal* in *two words,* an active verb and descriptive noun
- Rank your goals: in dollars, time, quality, approval, aggravation, etc.
- Measure or define your current state for each goal
- Pick one or two issues, don't try to do everything at once
- Create an action plan. An action plan must include:
  - Goal definition
  - Tasks to achieve the goal
  - A champion and staffing
  - A realistic Budget!
  - A Schedule

Lean Design Tools

(In Order of Importance)

- Reduce Muda! QA/QC Plan that includes formal, third party team reviews, using written checklists, at every phase of every project
- Improve Flow! Written Project Management Guidelines that set out the tasks required for every project
- 5S's-Streamline, Reorganize, Optimize, Standardize, Train
- Use Earned Value Analysis to estimate partial project completion to compare it to scheduled completion costs
- Target Value Design to keep design in construction budget

Washington State A/E Results After 4 Years of Lean

- A/E change Orders reduced from 3.8% to 0.2%
- RFIs reduced by 45%
- Bid busts reduced from 45% to 10%
- 55.3% to 57.4% Utilization Rate (includes PTO)
- 191% to 210% OH
- **2.8 to 4.4** Net Multiplier!
- O.2% to 34% profit: then **32%** for 5 years (firm dissolved)

Lean 5-Year Financial Projections

Profit possibilities

- Assuming lean process implementation, profitability may go down in year one, go up in year two, and continue to rise rapidly until years four and five when it begins to level out
- Year one, profit may drop from 13% to 6 or 7%
- Year two, could see profit increase to 15% or so
- Year three, likely 21%
- Year four, possibly 28%
- Year five beyond, could remain 28-32%

Benefits of Lean Design

- Lower costs for A/E caused change orders (3.4% to .2%)
- Up to 50% fewer RFIs
- 20-30% less construction management time
- Fewer claims and lower insurance costs
- Easier to bid
- Fewer delays and better projects
- Faster/easier/safer construction
- More profitability for everyone
- Happier Clients and more repeat work

Questions?

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